WHAT IS CLAIMED IS:

    1. A human interleukin-3 mutant polypeptide
Formula I:

Ala Pro Met Thr Gln Thr Thr Ser Leu Lys Thr Ser Trp Val Asn
 1   5   10   15

Cys Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
       20   25   30

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Asn Xaa Xaa Xaa Xaa Xaa Xaa
       35   40   45

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
       50   55   60

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
       65   70   75

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
       80   85   90

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
       95 100   105

Xaa Phe Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
     110 115   120

Xaa Xaa Xaa Gln Gln Thr Thr Leu Ser Leu Ala Ile Phe [SEQ ID
     125 130

NO:15]

wherein Xaa at position 17 is Ser, Lys, Gly, Asp, Met, Gln, or
     Arg;
Xaa at position 18 is Asn, His, Leu, Ile, Phe, Arg, or Gln;

Xaa at position 19 is Met, Phe, Ile, Arg, Gly, Ala, or Cys;

Xaa at position 20 is Ile, Cys, Gln, Glu, Arg, Pro, or Ala;

Xaa at position 21 is Asp, Phe, Lys, Arg, Ala, Gly, Glu, Gln,

Asn, Thr, Ser or

5   Val;

Xaa at position 22 is Glu, Trp, Pro, Ser, Ala, His, Asp, Asn,

Gln, Leu, Val or

          Gly;

Xaa at position 23 is Ile, Val, Ala, Leu, Gly, Trp, Lys, Phe,

10   Leu, Ser, or Arg;

Xaa at position 24 is Ile, Gly, Val, Arg, Ser, Phe, or Leu;

Xaa at position 25 is Thr, His, Gly, Gln, Arg, Pro, or Ala;

Xaa at position 26 is His, Thr, Phe, Gly, Arg, Ala, or Trp;

Xaa at position 27 is Leu, Gly, Arg, Thr, Ser, or Ala;

15   Xaa at position 28 is Lys, Arg, Leu, Gln, Gly, Pro, Val or Trp;

Xaa at position 29 is Gln, Asn, Leu, Pro, Arg, or Val;

Xaa at position 30 is Pro, His, Thr, Gly, Asp, Gln, Ser, Leu, or

          Lys;

Xaa at position 31 is Pro, Asp, Gly, Ala, Arg, Leu, or Gln;

20   Xaa at position 32 is Leu, Val, Arg, Gln, Asn, Gly, Ala, or Glu;

Xaa at position 33 is Pro, Leu, Gln, Ala, Thr, or Glu;

Xaa at position 34 is Leu, Val, Gly, Ser, Lys, Glu, Gln, Thr,

Arg, Ala, Phe,

          Ile or Met;

25   Xaa at position 35 is Leu, Ala, Gly, Asn, Pro, Gln, or Val;

Xaa at position 36 is Asp, Leu, or Val;

Xaa at position 37 is Phe, Ser, Pro, Trp, or Ile;

Xaa at position 38 is Asn, or Ala;

Xaa at position 40 is Leu, Trp, or Arg;

30   Xaa at position 41 is Asn, Cys, Arg, Leu, His, Met, or Pro;

Xaa at position 42 is Gly, Asp, Ser, Cys, Asn, Lys, Thr, Leu,

Val, Glu, Phe,

          Tyr, Ile, Met or Ala;

Xaa at position 43 is Glu, Asn, Tyr, Leu, Phe, Asp, Ala, Cys,

35   Gln, Arg, Thr,

          Gly or Ser;

Xaa at position 44 is Asp, Ser, Leu, Arg, Lys, Thr, Met, Trp, Glu, Asn, Gln,

Ala or Pro;

Xaa at position 45 is Gln, Pro, Phe, Val, Met, Leu, Thr, Lys,
5   Trp, Asp, Asn,

Arg, Ser, Ala, Ile, Glu or His;

Xaa at position 46 is Asp, Phe, Ser, Thr, Cys, Glu, Asn, Gln, Lys, His, Ala,

Tyr, Ile, Val or Gly;

10   Xaa at position 47 is Ile, Gly, Val, Ser, Arg, Pro, or His;

Xaa at position 48 is Leu, Ser, Cys, Arg, Ile, His, Phe, Glu, Lys, Thr, Ala,

Met, Val or Asn;

Xaa at position 49 is Met, Arg, Ala, Gly, Pro, Asn, His, or Asp;

15   Xaa at position 50 is Glu, Leu, Thr, Asp, Tyr, Lys, Asn, Ser, Ala, Ile, Val,

His, Phe, Met or Gln;

Xaa at position 51 is Asn, Arg, Met, Pro, Ser, Thr, or His;

Xaa at position 52 is Asn, His, Arg, Leu, Gly, Ser, or Thr;

20   Xaa at position 53 is Leu, Thr, Ala, Gly, Glu, Pro, Lys, Ser, or
Met;

Xaa at position 54 is Arg, Asp, Ile, Ser, Val, Thr, Gln, Asn, Lys,

His, Ala or Leu;

25   Xaa at position 55 is Arg, Thr, Val, Ser, Leu, or Gly;

Xaa at position 56 is Pro, Gly, Cys, Ser, Gln, Glu, Arg, His, Thr, Ala, Tyr, Phe, Leu, Val or Lys;

Xaa at position 57 is Asn or Gly;

Xaa at position 58 is Leu, Ser, Asp, Arg, Gln, Val, or Cys;

30   Xaa at position 59 is Glu Tyr, His, Leu, Pro, or Arg;

Xaa at position 60 is Ala, Ser, Pro, Tyr, Asn, or Thr;

Xaa at position 61 is Phe, Asn, Glu, Pro, Lys, Arg, or Ser;

Xaa at position 62 is Asn His, Val, Arg, Pro, Thr, Asp, or Ile;

Xaa at position 63 is Arg, Tyr, Trp, Lys, Ser, His, Pro, or Val;

35   Xaa at position 64 is Ala, Asn, Pro, Ser, or Lys;

Xaa at position 65 is Val, Thr, Pro, His, Leu, Phe, or Ser;

Xaa at position 66 is Lys, Ile, Arg, Val, Asn, Glu, or Ser;

Xaa at position 67 is Ser, Ala, Phe, Val, Gly, Asn, Ile, Pro, or His;

Xaa at position 68 is Leu, Val, Trp, Ser, Ile, Phe, Thr, or His;

5   Xaa at position 69 is Gln, Ala, Pro, Thr, Glu, Arg, Trp, Gly, or Leu;

Xaa at position 70 is Asn, Leu, Val, Trp, Pro, or Ala;

Xaa at position 71 is Ala, Met, Leu, Pro, Arg, Glu, Thr, Gln, Trp, or Asn;

10   Xaa at position 72 is Ser, Glu, Met, Ala, His, Asn, Arg, or Asp;

Xaa at position 73 is Ala, Glu, Asp, Leu, Ser, Gly, Thr, or Arg;

Xaa at position 74 is Ile, Met, Thr, Pro, Arg, Gly, Ala;

Xaa at position 75 is Glu, Lys, Gly, Asp, Pro, Trp, Arg, Ser, Gln, or Leu;

15   Xaa at position 76 is Ser, Val, Ala, Asn, Trp, Glu, Pro, Gly, or Asp;

Xaa at position 77 is Ile, Ser, Arg, Thr, or Leu;

Xaa at position 78 is Leu, Ala, Ser, Glu, Phe, Gly, or Arg;

Xaa at position 79 is Lys, Thr, Asn, Met, Arg, Ile, Gly, or

20   Asp;

Xaa at position 80 is Asn, Trp, Val, Gly, Thr, Leu, Glu, or Arg;

Xaa at position 81 is Leu, Gln, Gly, Ala, Trp, Arg, Val, or Lys;

Xaa at position 82 is Leu, Gln, Lys, Trp, Arg, Asp, Glu, Asn, His,

25   Thr, Ser, Ala, Tyr, Phe, Ile, Met or Val;

Xaa at position 83 is Pro, Ala, Thr, Trp, Arg, or Met;

Xaa at position 84 is Cys, Glu, Gly, Arg, Met, or Val;

Xaa at position 85 is Leu, Asn, Val, or Gln;

Xaa at position 86 is Pro, Cys, Arg, Ala, or Lys;

30   Xaa at position 87 is Leu, Ser, Trp, or Gly;

Xaa at position 88 is Ala, Lys, Arg, Val, or Trp;

Xaa at position 89 is Thr, Asp, Cys, Leu, Val, Glu, His, Asn, or Ser;

Xaa at position 90 is Ala, Pro, Ser, Thr, Gly, Asp, Ile, or Met;

35   Xaa at position 91 is Ala, Pro, Ser, Thr, Phe, Leu, Asp, or His;

Xaa at position 92 is Pro, Phe, Arg, Ser, Lys, His, Ala, Gly, Ile

or Leu;

Xaa at position 93 is Thr, Asp, Ser, Asn, Pro, Ala, Leu, or Arg;

Xaa at position 94 is Arg, Ile, Ser, Glu, Leu, Val, Gln, Lys, His, Ala, or

Pro;

Xaa at position 95 is His, Gln, Pro, Arg, Val, Leu, Gly, Thr, Asn, Lys, Ser,

Ala, Trp, Phe, Ile, or Tyr;

Xaa at position 96 is Pro, Lys, Tyr, Gly, Ile, or Thr;

Xaa at position 97 is Ile, Val, Lys, Ala, or Asn;

Xaa at position 98 is His, Ile, Asn, Leu, Asp, Ala, Thr, Glu, Gln, Ser, Phe, Met, Val, Lys, Arg, Tyr or Pro;

Xaa at position 99 is Ile, Leu, Arg, Asp, Val, Pro, Gln, Gly, Ser, Phe, or His;

Xaa at position 100 is Lys, Tyr, Leu, His, Arg, Ile, Ser, Gln, or Pro;

Xaa at position 101 is Asp, Pro, Met, Lys, His, Thr, Val, Tyr, Glu, Asn, Ser, Ala, Gly, Ile, Leu, or Gln;

Xaa at position 102 is Gly, Leu, Glu, Lys, Ser, Tyr, or Pro;

Xaa at position 103 is Asp, or Ser;

Xaa at position 104 is Trp, Val, Cys, Tyr, Thr, Met, Pro, Leu, Gln, Lys, Ala, Phe, or Gly;

Xaa at position 105 is Asn, Pro, Ala, Phe, Ser, Trp, Gln, Tyr, Leu, Lys, Ile, Asp, or His;

Xaa at position 106 is Glu, Ser, Ala, Lys, Thr, Ile, Gly, or Pro;

Xaa at position 108 is Arg, Lys, Asp, Leu, Thr, Ile, Gln, His, Ser, Ala or

Pro;

Xaa at position 109 is Arg, Thr, Pro, Glu, Tyr, Leu, Ser, or Gly;

Xaa at position 110 is Lys, Ala, Asn, Thr, Leu, Arg, Gln, His, Glu, Ser, Ala,

or Trp;

Xaa at position 111 is Leu, Ile, Arg, Asp, or Met;

Xaa at position 112 is Thr, Val, Gln, Tyr, Glu, His, Ser, or Phe;

Xaa at position 113 is Phe, Ser, Cys, His, Gly, Trp, Tyr, Asp, Lys, Leu, Ile, Val or Asn;

Xaa at position 114 is Tyr, Cys, His, Ser, Trp, Arg, or Leu;

Xaa at position 115 is Leu, Asn, Val, Pro, Arg, Ala, His, Thr,
Trp, or Met;

Xaa at position 116 is Lys, Leu, Pro, Thr, Met, Asp, Val, Glu,
Arg, Trp, Ser, Asn, His, Ala, Tyr, Phe, Gln, or Ile;

Xaa at position 117 is Thr, Ser, Asn, Ile, Trp, Lys, or Pro;

Xaa at position 118 is Leu, Ser, Pro, Ala, Glu, Cys, Asp, or Tyr;

Xaa at position 119 is Glu, Ser, Lys, Pro, Leu, Thr, Tyr, or Arg;

Xaa at position 120 is Asn, Ala, Pro, Leu, His, Val, or Gln;

Xaa at position 121 is Ala, Ser, Ile, Asn, Pro, Lys, Asp, or
Gly;

Xaa at position 122 is Gln, Ser, Met, Trp, Arg, Phe, Pro, His,
Ile, Tyr, or Cys;

Xaa at position 123 is Ala, Met, Glu, His, Ser, Pro, Tyr, or Leu;

and which can additionally have Met- preceding the amino acid in
position 1; and wherein from 1 to 14 amino acids can be deleted
from the N-terminus and/or from 1 to 15 amino acids can be
deleted from the C-terminus; and wherein from 4 to 44 of the
amino acids designated by Xaa are different from the
corresponding amino acids of native (1-133) human interleukin-3.

2.   A human interleukin-3 mutant polypeptide of the
Formula II:

Ala Pro Met Thr Gln Thr Thr Ser Leu Lys Thr Ser Trp Val Asn
 1   5   10   15

Cys Xaa Xaa Xaa Xaa Xaa Glu Xaa Xaa Xaa Xaa Leu Xaa Xaa Xaa
            20 25   30

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Asn Leu Xaa Xaa Glu Xaa Xaa
            35 40   45

Xaa Xaa Leu Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Asn Leu Xaa Xaa

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              50      55                    60

     Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
              65      70                    75
5
     Xaa Xaa Leu Xaa Xaa Xaa Xaa Xaa Cys Xaa Pro Xaa Xaa Xaa Xaa
              80      85                    90

     Xaa Xaa Xaa Arg Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Asp Xaa Xaa
10            95      100                   105

     Xaa Phe Xaa Xaa Lys Leu Xaa Phe Xaa Xaa Xaa Xaa Leu Xaa Xaa
              110 115                   120

     Xaa Xaa Xaa Gln Gln Thr Thr Leu Ser Leu Ala Ile Phe [SEQ ID
15   NO:16]
              125 130
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wherein

Xaa at position 17 is Ser, Gly, Asp, Met, or Gln;

20 Xaa at position 18 is Asn, His, Leu, Ile, Phe, Arg, or Gln;

Xaa at position 19 is Met, Phe, Ile, Arg, or Ala;

Xaa at position 20 is Ile or Pro;

Xaa at position 21 is Asp or Glu;

Xaa at position 23 is Ile, Val, Ala, Leu, or Gly;

25 Xaa at position 24 is Ile, Val, Phe, or Leu;

Xaa at position 25 is Thr, His, Gly, Gln, Arg, Pro, or Ala;

Xaa at position 26 is His, Phe, Gly, Arg, or Ala;

Xaa at position 28 is Lys, Leu, Gln, Gly, Pro, or Val;

Xaa at position 29 is Gln, Asn, Leu, Arg, or Val;

30 Xaa at position 30 is Pro, His, Thr, Gly, or Gln;

Xaa at position 31 is Pro, Asp, Gly, Ala, Arg, Leu, or Gln;

Xaa at position 32 is Leu, Arg, Gln, Asn, Gly, Ala, or Glu;

Xaa at position 33 is Pro, Leu, Gln, Ala, or Glu;

Xaa at position 34 is Leu, Val, Gly, Ser, Lys, Ala, Arg, Gln,

35 Glu,

  Ile, Phe, Thr or Met;

Xaa at position 35 is Leu, Ala, Asn, Pro, Gln, or Val;

Xaa at position 36 is Asp or Leu;

Xaa at position 37 is Phe, Ser, Pro, Trp, or Ile;

Xaa at position 38 is Asn or Ala;

5   Xaa at position 41 is Asn, Cys, Arg, His, Met, or Pro;

Xaa at position 42 is Gly, Asp, Ser, Cys, Ala, Asn, Ile, Leu, Met,

       Tyr, Val or Arg;

Xaa at position 44 is Asp or Glu;

10   Xaa at position 45 is Gln, Val, Met, Leu, Thr, Lys, Ala, Asn, Glu,

       Ser, or Trp;

Xaa at position 46 is Asp, Phe, Ser, Thr, Cys, Ala, Asn, Gln, Glu,

15   His, Ile, Lys, Tyr, Val or Gly;

Xaa at position 47 is Ile, Val, or His;

Xaa at position 49 is Met, Asn, or Asp;

Xaa at position 50 is Glu, Thr, Ala, Asn, Ser or Asp;

Xaa at position 51 is Asn, Arg, Met, Pro, Ser, Thr, or His;

20   Xaa at position 52 is Asn or Gly;

Xaa at position 53 is Leu, Met, or Phe;

Xaa at position 54 is Arg, Ala, or Ser;

Xaa at position 55 is Arg, Thr, Val, Leu, or Gly;

Xaa at position 56 is Pro, Gly, Cys, Ser, Gln, Ala, Arg, Asn,

25   Glu, His, Leu,

       Thr, Val or Lys;

Xaa at position 59 is Glu, Tyr, His, Leu, or Arg;

Xaa at position 60 is Ala, Ser, Asn, or Thr;

Xaa at position 61 is Phe or Ser;

30   Xaa at position 62 is Asn, Val, Pro; Thr, or Ile;

Xaa at position 63 is Arg, Tyr, Lys, Ser, His, or Val;

Xaa at position 64 is Ala or Asn;

Xaa at position 65 is Val, Thr, Leu, or Ser;

Xaa at position 66 is Lys, Ile, Arg, Val, Asn, Glu, or Ser;

35   Xaa at position 67 is Ser, Phe, Val, Gly, Asn, Ile, or His;

Xaa at position 68 is Leu, Val, Ile, Phe, or His;

Xaa at position 69 is Gln, Ala, Pro, Thr, Glu, Arg, or Gly;

Xaa at position 70 is Asn or Pro;

Xaa at position 71 is Ala, Met, Pro, Arg, Glu, Thr, or Gln;

Xaa at position 72 is Ser, Glu, Met, Ala, His, Asn, Arg, or Asp;

5   Xaa at position 73 is Ala, Glu, Asp, Leu, Ser, Gly, Thr, Arg, or

       Pro;

Xaa at position 74 is Ile or Met;

Xaa at position 75 is Glu, Gly, Asp, Ser, or Gln;

Xaa at position 76 is Ser, Val, Ala, Asn, Glu, Pro, Gly, or

10   Asp;

Xaa at position 77 is Ile, Ser, or Leu;

Xaa at position 79 is Lys, Thr, Gly, Asn, Met, Arg, Ile, Gly, or

      Asp;

Xaa at position 80 is Asn, Val, Gly, Thr, Leu, Glu, or Arg;

15   Xaa at position 81 is Leu, or Val;

Xaa at position 82 is Leu, Gln, Trp, Arg, Asp, Ala, Asn, Glu,

His,

      Met, Phe, Ser, Thr, Tyr or Val;

Xaa at position 83 is Pro, Ala, Thr, Trp, or Met;

20   Xaa at position 85 is Leu or Val;

Xaa at position 87 is Leu or Ser;

Xaa at position 88 is Ala, Arg, or Trp;

Xaa at position 89 is Thr, Asp, Glu, His, Asn, or Ser;

Xaa at position 90 is Ala, Asp, or Met;

25   Xaa at position 91 is Ala, Pro, Ser, Thr, Phe, Leu, or Asp;

Xaa at position 92 is Pro or Ser;

Xaa at position 93 is Thr, Asp, Ser, Pro, Ala, Leu, or Arg;

Xaa at position 95 is His, Pro, Arg, Val, Leu, Gly, Asn, Ile,

Phe,

30   Ser or Thr;

Xaa at position 96 is Pro or Tyr;

Xaa at position 97 is Ile, Val, or Ala;

Xaa at position 98 is His, Ile, Asn, Leu, Asp, Ala, Thr, Leu,

Arg, Gln, Glu,

35   Lys, Met, Ser, Tyr, Val or Pro;

Xaa at position 99 is Ile, Leu, Val, or Phe;

Xaa at position 100 is Lys, Leu, His, Arg, Ile, Gln, Pro, or
   Ser;

Xaa at position 101 is Asp, Pro, Met, Lys, His, Thr, Val,
   Asn, Ile, Leu or Tyr;

5 Xaa at position 102 is Gly, Glu, Lys, or Ser;

Xaa at position 104 is Trp, Val, Tyr, Met, or Leu;

Xaa at position 105 is Asn, Pro, Ala, Phe, Ser, Trp, Gln, Tyr,
   Leu, Lys, Ile, Asp, or His;

Xaa at position 106 is Glu, Ser, Ala, or Gly;

10 Xaa at position 108 is Arg, Ala, Gln, Ser or Lys;

Xaa at position 109 is Arg, Thr, Glu, Leu, Ser, or Gly;

Xaa at position 112 is Thr, Val, Gln, Glu, His, or Ser;

Xaa at position 114 is Tyr or Trp;

Xaa at position 115 is Leu or Ala;

15 Xaa at position 116 is Lys, Thr, Met, Val, Trp, Ser, Leu, Ala,
Asn,
   Gln, His, Met, Phe, Tyr or Ile;

Xaa at position 117 is Thr, Ser, or Asn;

Xaa at position 119 is Glu, Ser, Pro, Leu, Thr, or Tyr;

20 Xaa at position 120 is Asn, Pro, Leu, His, Val, or Gln;

Xaa at position 121 is Ala, Ser, Ile, Asn, Pro, Lys, Asp, or
   Gly;

Xaa at position 122 is Gln, Ser, Met, Trp, Arg, Phe, Pro, His,
   Ile, Tyr, or Cys;

25 Xaa at position 123 is Ala, Met, Glu, His, Ser, Pro, Tyr, or Leu;

and which can additionally have Met- preceding the amino acid in

position 1; and wherein from 1 to 14 amino acids can be deleted

from the N-terminus and/or from 1 to 15 amino acids can be

30 deleted from the C-terminus; and wherein from 4 to 44 of the

amino acids designated by Xaa are different from the

corresponding amino acids of native (1-133) human interleukin-3.

3. A human interleukin-3 mutant polypeptide

35 according to claim 2 of the Formula III:

```
Ala Pro Met Thr Gln Thr Thr Ser Leu Lys Thr Ser Trp Val Asn
 1           5   10                  15

Cys Xaa Xaa Xaa Ile Xaa Glu Xaa Xaa Xaa Xaa Leu Lys Xaa Xaa
             20  25                  30

Xaa Xaa Xaa Xaa Xaa Asp Xaa Xaa Asn Leu Asn Xaa Glu Xaa Xaa
             35  40                  45

Xaa Ile Leu Met Xaa Xaa Asn Leu Xaa Xaa Xaa Asn Leu Glu Xaa
             50  55                  60

Phe Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Asn Xaa Xaa Xaa Ile Glu
             65  70                  75

Xaa Xaa Leu Xaa Xaa Leu Xaa Xaa Cys Xaa Pro Xaa Xaa Thr Ala
             80  85                  90

Xaa Pro Xaa Arg Xaa Xaa Xaa Xaa Xaa Xaa Xaa Gly Asp Xaa Xaa
             95  100                 105

Xaa Phe Xaa Xaa Lys Leu Xaa Phe Xaa Xaa Xaa Xaa Leu Glu Xaa
             110 115                 120

Xaa Xaa Xaa Gln Gln Thr Thr Leu Ser Leu Ala Ile Phe [SEQ ID
NO:17]
             125 130
```

wherein

Xaa at position 17 is Ser, Gly, Asp, Met, or Gln;

Xaa at position 18 is Asn, His, or Ile;

Xaa at position 19 is Met or Ile;

Xaa at position 21 is Asp or Glu;

Xaa at position 23 is Ile, Ala, Leu, or Gly;

Xaa at position 24 is Ile, Val, or Leu;

Xaa at position 25 is Thr, His, Gln, or Ala;

Xaa at position 26 is His or Ala;

Xaa at position 29 is Gln, Asn, or Val;

Xaa at position 30 is Pro, Gly, or Gln;

Xaa at position 31 is Pro, Asp, Gly, or Gln;

5   Xaa at position 32 is Leu, Arg, Gln, Asn, Gly, Ala, or Glu;

Xaa at position 33 is Pro or Glu;

Xaa at position 34 is Leu, Val, Gly, Ser, Lys, Ala, Arg, Gln,

Glu, Ile, Phe, Thr or Met;

Xaa at position 35 is Leu, Ala, Asn, Pro, Gln, or Val;

10 Xaa at position 37 is Phe, Ser, Pro, or Trp;

Xaa at position 38 is Asn or Ala;

Xaa at position 42 is Gly, Asp, Ser, Cys, Ala, Asn, Ile, Leu,

Met, Tyr or Arg;

Xaa at position 44 is Asp or Glu;

15 Xaa at position 45 is Gln, Val, Met, Leu, Thr, Ala, Asn, Glu,

Ser or Lys;

Xaa at position 46 is Asp, Phe, Ser, Thr, Ala, Asn Gln, Glu, His,

Ile, Lys, Tyr, Val or Cys;

Xaa at position 50 is Glu, Ala, Asn, Ser or Asp;

20 Xaa at position 51 is Asn, Arg, Met, Pro, Ser, Thr, or His;

Xaa at position 54 is Arg or Ala;

Xaa at position 55 is Arg, Thr, Val, Leu, or Gly;

Xaa at position 56 is Pro, Gly, Ser, Gln, Ala, Arg, Asn, Glu,

Leu, Thr, Val or Lys;

25 Xaa at position 60 is Ala or Ser;

Xaa at position 62 is Asn, Pro, Thr, or Ile;

Xaa at position 63 is Arg or Lys;

Xaa at position 64 is Ala or Asn;

Xaa at position 65 is Val or Thr;

30 Xaa at position 66 is Lys or Arg;

Xaa at position 67 is Ser, Phe, or His;

Xaa at position 68 is Leu, Ile, Phe, or His;

Xaa at position 69 is Gln, Ala, Pro, Thr, Glu, Arg, or Gly;

Xaa at position 71 is Ala, Pro, or Arg;

35 Xaa at position 72 is Ser, Glu, Arg, or Asp;

Xaa at position 73 is Ala or Leu;

Xaa at position 76 is Ser, Val, Ala, Asn, Glu, Pro, or Gly;

Xaa at position 77 is Ile or Leu;

Xaa at position 79 is Lys, Thr, Gly, Asn, Met, Arg, Ile, Gly, or

Asp;

5   Xaa at position 80 is Asn, Gly, Glu, or Arg;

Xaa at position 82 is Leu, Gln, Trp, Arg, Asp, Ala, Asn, Glu,

His,

Ile, Met, Phe, Ser, Thr, Tyr or Val;

Xaa at position 83 is Pro or Thr;

10   Xaa at position 85 is Leu or Val;

Xaa at position 87 is Leu or Ser;

Xaa at position 88 is Ala or Trp;

Xaa at position 91 is Ala or Pro;

Xaa at position 93 is Thr, Asp, Ser, Pro, Ala, Leu, or Arg;

15   Xaa at position 95 is His, Pro, Arg, Val, Leu, Gly, Asn, Phe, Ser

or Thr;

Xaa at position 96 is Pro or Tyr;

Xaa at position 97 is Ile or Val;

Xaa at position 98 is His, Ile, Asn, Leu, Ala, Thr, Leu, Arg,

20   Gln,

Leu, Lys, Met, Ser, Tyr, Val or Pro;

Xaa at position 99 is Ile, Leu, or Val;

Xaa at position 100 is Lys, Arg, Ile, Gln, Pro, or Ser;

Xaa at position 101 is Asp, Pro, Met, Lys, His, Thr, Pro, Asn,

25   Ile, Leu or Tyr;

Xaa at position 104 is Trp or Leu;

Xaa at position 105 is Asn, Pro, Ala, Ser, Trp, Gln, Tyr, Leu,

Lys, Ile, Asp, or His;

Xaa at position 106 is Glu or Gly;

30   Xaa at position 108 is Arg, Ala, or Ser;

Xaa at position 109 is Arg, Thr, Glu, Leu, or Ser;

Xaa at position 112 is Thr, Val, or Gln;

Xaa at position 114 is Tyr or Trp;

Xaa at position 115 is Leu or Ala;

35   Xaa at position 116 is Lys, Thr, Val, Trp, Ser, Ala, His, Met,

Phe, Tyr or Ile;

Xaa at position 117 is Thr or Ser;

Xaa at position 120 is Asn, Pro, Leu, His, Val, or Gln;

Xaa at position 121 is Ala, Ser, Ile, Asn, Pro, Asp, or Gly;

Xaa at position 122 is Gln, Ser, Met, Trp, Arg, Phe, Pro, His,

5   Ile, Tyr, or Cys;

Xaa at position 123 is Ala, Met, Glu, His, Ser, Pro, Tyr, or Leu;

and which can additionally have Met- preceding the amino acid in

position 1; and wherein from 1 to 14 amino acids can be deleted

10 from the N-terminus and/or from 1 to 15 amino acids can be

deleted from the C-terminus; and wherein from 4 to 35 of the

amino acids designated by Xaa are different from the

corresponding amino acids of native (1-133)human interleukin-3.

15   4. A human interleukin-3 mutant polypeptide according to

Claim 3 of the Formula IV:

Ala Pro Met Thr Gln Thr Thr Ser Leu Lys Thr Ser Trp Val Asn

1   5   10   15

20

Cys Xaa Xaa Met Ile Asp Glu Xaa Ile Xaa Xaa Leu Lys Xaa Xaa

         20   25   30

Pro Xaa Pro Xaa Xaa Asp Phe Xaa Asn Leu Asn Xaa Glu Asp Xaa

25   35   40   45

Xaa Ile Leu Met Xaa Xaa Asn Leu Arg Xaa Xaa Asn Leu Glu Ala

         50   55   60

30 Phe Xaa Arg Xaa Xaa Lys Xaa Xaa Xaa Asn Ala Ser Ala Ile Glu

        65   70   75

Xaa Xaa Leu Xaa Xaa Leu Xaa Pro Cys Leu Pro Xaa Xaa Thr Ala

        80   85   90

35

Xaa Pro Xaa Arg Xaa Pro Ile Xaa Xaa Xaa Xaa Gly Asp Trp Xaa

```
              95    100                105

   Glu Phe Xaa Xaa Lys Leu Xaa Phe Tyr Leu Xaa Xaa Leu Glu Xaa
              110   115                120
5

   Xaa Xaa Xaa Gln Gln Thr Thr Leu Ser Leu Ala Ile Phe [SEQ ID
   NO:18]
              125   130

   wherein

10 Xaa at position 17 is Ser, Gly, Asp, or Gln;

   Xaa at position 18 is Asn, His, or Ile;

   Xaa at position 23 is Ile, Ala, Leu, or Gly;

   Xaa at position 25 is Thr, His, or Gln;

   Xaa at position 26 is His or Ala;

15 Xaa at position 29 is Gln or Asn;

   Xaa at position 30 is Pro or Gly;

   Xaa at position 32 is Leu, Arg, Asn, or Ala;

   Xaa at position 34 is Leu, Val, Ser, Ala, Arg, Gln, Glu, Ile,
         Phe, Thr, or Met;

20 Xaa at position 35 is Leu, Ala, Asn, or Pro;

   Xaa at position 38 is Asn or Ala;

   Xaa at position 42 is Gly, Asp, Ser, Ala, Asn, Ile, Leu, Met,
         Tyr or Arg;

   Xaa at position 45 is Gln, Val, Met, Leu, Ala, Asn, Glu, or Lys;

25 Xaa at position 46 is Asp, Phe, Ser, Gln, Glu, His, Val
         or Thr;

   Xaa at position 50 is Glu Asn, Ser or Asp;

   Xaa at position 51 is Asn, Arg, Pro, Thr, or His;

   Xaa at position 55 is Arg, Leu, or Gly;

30 Xaa at position 56 is Pro, Gly, Ser, Ala, Asn, Val, Leu or Gln;

   Xaa at position 62 is Asn, Pro, or Thr;

   Xaa at position 64 is Ala or Asn;

   Xaa at position 65 is Val or Thr;

   Xaa at position 67 is Ser or Phe;

35 Xaa at position 68 is Leu or Phe;

   Xaa at position 69 is Gln, Ala, Glu, or Arg;
```

Xaa at position 76 is Ser, Val, Asn, Pro, or Gly;

Xaa at position 77 is Ile or Leu;

Xaa at position 79 is Lys, Gly, Asn, Met, Arg, Ile, or Gly;

Xaa at position 80 is Asn, Gly, Glu, or Arg;

5   Xaa at position 82 is Leu, Gln, Trp, Arg, Asp, Asn, Glu, His, Met,

    Phe, Ser, Thr, Tyr or Val;

Xaa at position 87 is Leu or Ser;

Xaa at position 88 is Ala or Trp;

10   Xaa at position 91 is Ala or Pro;

Xaa at position 93 is Thr, Asp, or Ala;

Xaa at position 95 is His, Pro, Arg, Val, Gly, Asn, Ser or Thr;

Xaa at position 98 is His, Ile, Asn, Ala, Thr, Gln, Glu,

    Lys, Met, Ser, Tyr, Val or Leu;

15   Xaa at position 99 is Ile or Leu;

Xaa at position 100 is Lys or Arg;

Xaa at position 101 is Asp, Pro, Met, Lys, Thr, His, Pro, Asn, Ile,

    Leu or Tyr;

20   Xaa at position 105 is Asn, Pro, Ser, Ile or Asp;

Xaa at position 108 is Arg, Ala, or Ser;

Xaa at position 109 is Arg, Thr, Glu, Leu, or Ser;

Xaa at position 112 is Thr or Gln;

Xaa at position 116 is Lys, Val, Trp, Ala, His, Phe, Tyr or Ile;

25   Xaa at position 117 is Thr or Ser;

Xaa at position 120 is Asn, Pro, Leu, His, Val, or Gln;

Xaa at position 121 is Ala, Ser, Ile, Pro, or Asp;

Xaa at position 122 is Gln, Met, Trp, Phe, Pro, His, Ile, or Tyr;

Xaa at position 123 is Ala, Met, Glu, Ser, or Leu;

30

and which can additionally have Met- preceding the amino acid in

position 1; and wherein from 1 to 14 amino acids can be deleted

from the N-terminus and/or from 1 to 15 amino acids can be

deleted from the C-terminus; and wherein from 4 to 44 of the

35   amino acids designated by Xaa are different from the

corresponding amino acids of native (1-133)human interleukin-3.

5. The human interleukin-3 mutant polypeptide of claim 1 wherein 1-15 amino acids are deleted from the C-terminus and/or 1-14 amino acids are deleted from the N-terminus.

6. The human interleukin-3 mutant polypeptide of claim 1 wherein;

Xaa at position 42 is Gly, Asp, Ser, Ile, Leu, Met, Tyr, or Ala;

Xaa at position 45 is Gln, Val, Met or Asn;

Xaa at position 46 is Asp, Ser, Gln, His or Val;

Xaa at position 50 is Glu or Asp;

Xaa at position 51 is Asn, Pro or Thr;

Xaa at position 62 is Asn or Pro;

Xaa at position 76 is Ser, or Pro;

Xaa at position 82 is Leu, Trp, Asp, Asn Glu, His, Phe, Ser or Tyr;

Xaa at position 95 is His, Arg, Thr, Asn or Ser;

Xaa at position 98 is His, Ile, Leu, Ala, Gln, Lys, Met, Ser, Tyr or Val;.

Xaa at position 100 is Lys or Arg;

Xaa at position 101 is Asp, Pro, His, Asn, Ile or Leu;

Xaa at position 105 is Asn, or Pro;

Xaa at position 108 is Arg, Ala, or Ser;

Xaa at position 116 is Lys, Val, Trp, Ala, His, Phe, or Tyr;

Xaa at position 121 is Ala, or Ile;

Xaa at position 122 is Gln, or Ile; and

Xaa at position 123 is Ala, Met or Glu.

7. A (15-125) human interleukin-3 mutant polypeptide of the Formula V:

Asn Cys Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
 1   5   10   15

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Asn Xaa Xaa Xaa Xaa Xaa

```
            20   25                30
```

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa

```
            35   40                45
```

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa

```
            50   55                60
```

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa

```
            65   70                75
```

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa

```
            80   85                90
```

Xaa Xaa Phe Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa

```
            95  100                105
```

Xaa Xaa Xaa Xaa Gln Gln [SEQ ID NO:19]

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            110
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wherein

Xaa at position 3 is Ser, Lys, Gly, Asp, Met, Gln, or Arg;

Xaa at position 4 is Asn, His, Leu, Ile, Phe, Arg, or Gln;

Xaa at position 5 is Met, Phe, Ile, Arg, Gly, Ala, or Cys;

Xaa at position 6 is Ile, Cys, Gln, Glu, Arg, Pro, or Ala;

Xaa at position 7 is Asp, Phe, Lys, Arg, Ala, Gly, Glu, Gln, Asn,
    Thr, Ser or Val;

Xaa at position 8 is Glu, Trp, Pro, Ser, Ala, His, Asp, Asn, Gln,
    Leu, Val, or Gly;

Xaa at position 9 is Ile, Val, Ala, Leu, Gly, Trp, Lys, Phe,
    Leu, Ser, or Arg;

Xaa at position 10 is Ile, Gly, Val, Arg, Ser, Phe, or Leu;

Xaa at position 11 is Thr, His, Gly, Gln, Arg, Pro, or Ala;

Xaa at position 12 is His, Thr, Phe, Gly, Arg, Ala, or Trp;

Xaa at position 13 is Leu, Gly, Arg, Thr, Ser, or Ala;

Xaa at position 14 is Lys, Arg, Leu, Gln, Gly, Pro, Val or Trp;

Xaa at position 15 is Gln, Asn, Leu, Pro, Arg, or Val;

Xaa at position 16 is Pro, His, Thr, Gly, Asp, Gln, Ser, Leu, or
        Lys;

Xaa at position 17 is Pro, Asp, Gly, Ala, Arg, Leu, or Gln;

5   Xaa at position 18 is Leu, Val, Arg, Gln, Asn, Gly, Ala, or Glu;

Xaa at position 19 is Pro, Leu, Gln, Ala, Thr, or Glu;

Xaa at position 20 is Leu, Val, Gly, Ser, Lys, Glu, Gln, Thr,
        Arg, Ala, Phe, Ile or Met;

Xaa at position 21 is Leu, Ala, Gly, Asn, Pro, Gln, or Val;

10   Xaa at position 22 is Asp, Leu, or Val;

Xaa at position 23 is Phe, Ser, Pro, Trp, or Ile;

Xaa at position 24 is Asn, or Ala;

Xaa at position 26 is Leu, Trp, or Arg;

Xaa at position 27 is Asn, Cys, Arg, Leu, His, Met, Pro;

15   Xaa at position 28 is Gly, Asp, Ser, Cys, Ala, Lys, Asn, Thr,
     Leu,
        Val, Glu, Phe, Tyr, Ile or Met;

Xaa at position 29 is Glu, Asn, Tyr, Leu, Phe, Asp, Ala, Cys,
     Gln,

20   Arg, Thr, Gly or Ser;

Xaa at position 30 is Asp, Ser, Leu, Arg, Lys, Thr,Met, Trp, Glu,
        Asn, Gln, Ala or Pro;

Xaa at position 31 is Gln, Pro, Phe, Val, Met, Leu, Thr, Lys,
     Asp,

25   Asn, Arg, Ser, Ala, Ile, Glu, His or Trp;

Xaa at position 32 is Asp, Phe, Ser, Thr, Cys, Glu, Asn, Gln,
        Lys, His, Ala, Tyr, Ile, Val or Gly;

Xaa at position 33 is Ile, Gly, Val, Ser, Arg, Pro, or His;

Xaa at position 34 is Leu, Ser, Cys, Arg, Ile, His, Phe, Glu,

30   Lys, Thr, Ala, Met, Val or Asn;

Xaa at position 35 is Met, Arg, Ala, Gly, Pro, Asn, His, or Asp;

Xaa at position 36 is Glu, Leu, Thr, Asp, Tyr, Lys, Asn, Ser,
     Ala,
        Ile, Val, His, Phe, Met or Gln;

35   Xaa at position 37 is Asn, Arg, Met, Pro, Ser, Thr, or His;

Xaa at position 38 is Asn, His, Arg, Leu, Gly, Ser, or Thr;

Xaa at position 39 is Leu, Thr, Ala, Gly, Glu, Pro, Lys, Ser,
Met, or;

Xaa at position 40 is Arg, Asp, Ile, Ser, Val, Thr, Gln, Asn,
Lys, His, Ala or Leu;

5   Xaa at position 41 is Arg, Thr, Val, Ser, Leu, or Gly;

Xaa at position 42 is Pro, Gly, Cys, Ser, Gln, Glu, Arg, His,
Thr, Ala, Tyr, Phe, Leu, Val or Lys;

Xaa at position 43 is Asn or Gly;

Xaa at position 44 is Leu, Ser, Asp, Arg, Gln, Val or Cys;

10   Xaa at position 45 is Glu Tyr, His, Leu, Pro, or Arg;

Xaa at position 46 is Ala, Ser, Pro, Tyr, Asn, or Thr;

Xaa at position 47 is Phe, Asn, Glu, Pro, Lys, Arg, or Ser;

Xaa at position 48 is Asn, His, Val, Arg, Pro, Thr, Asp, or Ile;

Xaa at position 49 is Arg, Tyr, Trp, Lys, Ser, His, Pro, or Val;

15   Xaa at position 50 is Ala, Asn, Pro, Ser, or Lys;

Xaa at position 51 is Val, Thr, Pro, His, Leu, Phe, or Ser;

Xaa at position 52 is Lys, Ile, Arg, Val, Asn, Glu, or Ser;

Xaa at position 53 is Ser, Ala, Phe, Val, Gly, Asn, Ile, Pro, or
His;

20   Xaa at position 54 is Leu, Val, Trp, Ser, Ile, Phe, Thr, or His;

Xaa at position 55 is Gln, Ala, Pro, Thr, Glu, Arg, Trp, Gly, or
Leu;

Xaa at position 56 is Asn, Leu, Val, Trp, Pro, or Ala;

Xaa at position 57 is Ala, Met, Leu, Pro, Arg, Glu, Thr, Gln,

25   Trp, or Asn;

Xaa at position 58 is Ser, Glu, Met, Ala, His, Asn, Arg, or Asp;

Xaa at position 59 is Ala, Glu, Asp, Leu, Ser, Gly, Thr, or Arg;

Xaa at position 60 is Ile, Met, Thr, Pro, Arg, Gly, Ala;

Xaa at position 61 is Glu, Lys, Gly, Asp, Pro, Trp, Arg, Ser,

30   Gln, or Leu;

Xaa at position 62 is Ser, Val, Ala, Asn, Trp, Glu, Pro, Gly, or
Asp;

Xaa at position 63 is Ile, Ser, Arg, Thr, or Leu;

Xaa at position 64 is Leu, Ala, Ser, Glu, Phe, Gly, or Arg;

35   Xaa at position 65 is Lys, Thr, Gly, Asn, Met, Arg, Ile, or
Asp;

Xaa at position 66 is Asn, Trp, Val, Gly, Thr, Leu, Glu, or Arg;

Xaa at position 67 is Leu, Gln, Gly, Ala, Trp, Arg, Val, or Lys;

Xaa at position 68 is Leu, Gln, Lys, Trp, Arg, Asp, Glu, Asn,

His, Thr, Ser, Ala, Tyr, Phe, Ile, Met or Val;

5   Xaa at position 69 is Pro, Ala, Thr, Trp, Arg, or Met;

Xaa at position 70 is Cys, Glu, Gly, Arg, Met, or Val;

Xaa at position 71 is Leu, Asn, Val, or Gln;

Xaa at position 72 is Pro, Cys, Arg, Ala, or Lys;

Xaa at position 73 is Leu, Ser, Trp, or Gly;

10   Xaa at position 74 is Ala, Lys, Arg, Val, or Trp;

Xaa at position 75 is Thr, Asp, Cys, Leu, Val, Glu, His, Asn, or

Ser;

Xaa at position 76 is Ala, Pro, Ser, Thr, Gly, Asp, Ile, or Met;

Xaa at position 77 is Ala, Pro, Ser, Thr, Phe, Leu, Asp, or His;

15   Xaa at position 78 is Pro, Phe, Arg, Ser, Lys, His, Ala, Gly, Ile

or Leu;

Xaa at position 79 is Thr, Asp, Ser, Asn, Pro, Ala, Leu, or Arg;

Xaa at position 80 is Arg, Ile, Ser, Glu, Leu, Val, Gln, Lys,

His,

20   Ala or Pro;

Xaa at position 81 is His, Gln, Pro, Arg, Val, Leu, Gly, Thr,

Asn,

Lys, Ser, Ala, Trp, Phe, Ile or Tyr;

Xaa at position 82 is Pro, Lys, Tyr, Gly, Ile, or Thr;

25   Xaa at position 83 is Ile, Val, Lys, Ala, or Asn;

Xaa at position 84 is His, Ile, Asn, Leu, Asp, Ala, Thr, Glu,

Gln, Ser, Phe, Met, Val, Lys, Arg, Tyr or Pro;

Xaa at position 85 is Ile, Leu, Arg, Asp, Val, Pro, Gln,

Gly, Ser, Phe, or His;

30   Xaa at position 86 is Lys, Tyr, Leu, His, Arg, Ile, Ser, Gln,

Pro;

Xaa at position 87 is Asp, Pro, Met, Lys, His, Thr, Val,

Tyr, Glu, Asn, Ser, Ala, Gly, Ile, Leu or Gln;

Xaa at position 88 is Gly, Leu, Glu, Lys, Ser, Tyr, or Pro;

35   Xaa at position 89 is Asp, or Ser;

Xaa at position 90 is Trp, Val, Cys, Tyr, Thr, Met, Pro, Leu,

Gln, Lys, Ala, Phe, or Gly;

Xaa at position 91 is Asn, Pro, Ala, Phe, Ser, Trp, Gln, Tyr,
Leu, Lys, Ile, Asp, or His;

Xaa at position 92 is Glu, Ser, Ala, Lys, Thr, Ile, Gly, or Pro;

5 Xaa at position 94 is Arg, Lys, Asp, Leu, Thr, Ile, Gln,
His, Ser, Ala, or Pro;

Xaa at position 95 is Arg, Thr, Pro, Glu, Tyr, Leu, Ser, or Gly;

Xaa at position 96 is Lys, Asn, Thr, Leu, Gln, Arg,
His, Glu, Ser, Ala or Trp;

10 Xaa at position 97 is Leu, Ile, Arg, Asp, or Met;

Xaa at position 98 is Thr, Val, Gln, Tyr, Glu, His, Ser, or Phe;

Xaa at position 99 is Phe, Ser, Cys, His, Gly, Trp, Tyr, Asp,
.Lys, Leu, Ile, Val or Asn;

Xaa at position 100 is Tyr, Cys, His, Ser, Trp, Arg, or Leu;

· 15 Xaa at position 101 is Leu, Asn, Val, Pro, Arg, Ala, His, Thr,
Trp, or Met;

Xaa at position 102 is Lys, Leu, Pro, Thr, Met, Asp, Val, Glu,
Arg, Trp, Ser,
Asn, His, Ala, Tyr, Phe, Gln, or Ile;

20 Xaa at position 103 is Thr, Ser, Asn, Ile, Trp, Lys, or Pro;

Xaa at position 104 is Leu, Ser, Pro, Ala, Glu, Cys, Asp, or Tyr;

Xaa at position 105 is Glu, Ser, Lys, Pro, Leu, Thr, Tyr, or Arg;

Xaa at position 106 is Asn, Ala, Pro, Leu, His, Val, or Gln;

Xaa at position 107 is Ala, Ser, Ile, Asn, Pro, Lys, Asp, or
25 Gly;

Xaa at position 108 is Gln, Ser, Met, Trp, Arg, Phe, Pro, His,
Ile, Tyr, or Cys;

Xaa at position 109 is Ala, Met, Glu, His, Ser, Pro, Tyr, or Leu;

30 and which can additionally have Met- or Met-Ala- preceding the
amino acid in position 1; and wherein from 4 to 44 of the amino
acids designated by Xaa are different from the corresponding
native amino acids of (1-133) human interleukin-3; or a
polypeptide having substantially the same structure and
35 substantially the same biological activity.

8. A (15-125)human interleukin-3 mutant polypeptide
of the Formula VI:

```
    Asn Cys Xaa Xaa Xaa Xaa Xaa Glu Xaa Xaa Xaa Xaa Leu Xaa Xaa
5    1           5   10                  15

    Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Asn Leu Xaa Xaa Glu Xaa
                20  25                  30

10  Xaa Xaa Xaa Leu Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Asn Leu Xaa
                35  40                  45

    Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
                50  55                  60
15

    Xaa Xaa Xaa Leu Xaa Xaa Xaa Xaa Xaa Cys Xaa Pro Xaa Xaa Xaa
                65  70                  75

    Xaa Xaa Xaa Xaa Arg Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Asp Xaa
20              80  85                  90

    Xaa Xaa Phe Xaa Xaa Lys Leu Xaa Phe Xaa Xaa Xaa Xaa Leu Xaa
                95  100                 105

25  Xaa Xaa Xaa Xaa Gln Gln [SEQ ID NO:20]
                110
```
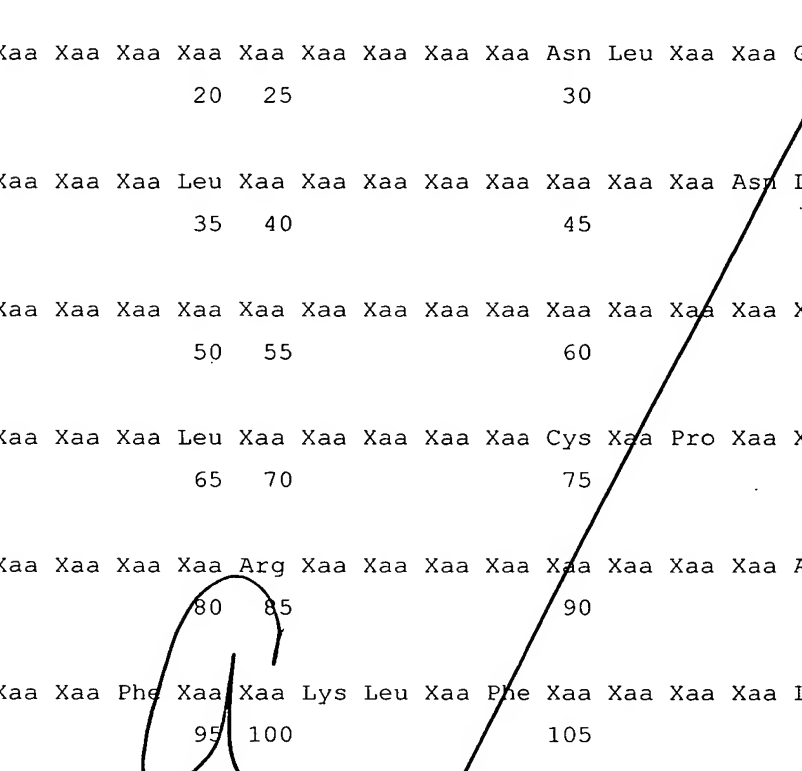
wherein
Xaa at position 3 is Ser, Gly, Asp, Met, or Gln;
30 Xaa at position 4 is Asn, His, Leu, Ile, Phe, Arg, or Gln;
Xaa at position 5 is Met, Phe, Ile, Arg, or Ala;
Xaa at position 6 is Ile or Pro;
Xaa at position 7 is Asp, or Glu;
Xaa at position 9 is Ile, Val, Ala, Leu, or Gly;
35 Xaa at position 10 is Ile, Val, Phe, or Leu;
Xaa at position 11 is Thr, His, Gly, Gln, Arg, Pro, or Ala;

Xaa at position 12 is His, Phe, Gly, Arg, or Ala;

Xaa at position 14 is Lys, Leu, Gln, Gly, Pro, or Val;

Xaa at position 15 is Gln, Asn, Leu, Arg, or Val;

Xaa at position 16 is Pro, His, Thr, Gly, or Gln;

5   Xaa at position 17 is Pro, Asp, Gly, Ala, Arg, Leu, or Gln;

Xaa at position 18 is Leu, Arg, Gln, Asn, Gly, Ala, or Glu;

Xaa at position 19 is Pro, Leu, Gln, Ala, or Glu;

Xaa at position 20 is Leu, Val, Gly, Ser, Lys, Ala, Arg, Gln,
      Glu, Ile, Phe, Thr or Met;

10   Xaa at position 21 is Leu, Ala, Asn, Pro, Gln, or Val;

Xaa at position 22 is Asp or Leu;

Xaa at position 23 is Phe, Ser, Pro, Trp, or Ile;

Xaa at position 24 is Asn or Ala;

Xaa at position 27 is Asn, Cys, Arg, His, Met, or Pro;

15   Xaa at position 28 is Gly, Asp, Ser, Cys, Ala, Asn, Ile, Leu,
      Met, Tyr, or Arg;

Xaa at position 30 is Asp, or Glu;

Xaa at position 31 is Gln, Val, Met, Leu, Thr, Lys, Ala, Asn Glu,
      Ser or Trp;

20   Xaa at position 32 is Asp, Phe, Ser, Thr, Cys, Ala, Asn, Gln,
      Glu, His, Ile, Lys, Tyr, Val or Gly;

Xaa at position 33 is Ile, Val, or His;

Xaa at position 35 is Met, Asn, or Asp;

Xaa at position 36 is Glu, Thr, Ala, Asn, Ser or Asp;

25   Xaa at position 37 is Asn, Arg, Met, Pro, Ser, Thr, or His;

Xaa at position 38 is Asn or Gly;

Xaa at position 39 is Leu, Met, or Phe;

Xaa at position 40 is Arg, Ala or Ser;

Xaa at position 41 is Arg, Thr, Val, Leu, or Gly;

30   Xaa at position 42 is Pro, Gly, Cys, Ser, Gln, Ala, Arg, Asn,
      Glu, His, Leu, Thr, Val or Lys;

Xaa at position 45 is Glu, Tyr, His, Leu, or Arg;

Xaa at position 46 is Ala, Ser, Asn, or Thr;

Xaa at position 47 is Phe or Ser;

35   Xaa at position 48 is Asn, Val, Pro, Thr, or Ile;

Xaa at position 49 is Arg, Tyr, Lys, Ser, His, or Val;

Xaa at position 50 is Ala or Asn;

Xaa at position 51 is Val, Thr, Leu, or Ser;

Xaa at position 52 is Lys, Ile, Arg, Val, Asn, Glu, or Ser;

Xaa at position 53 is Ser, Phe, Val, Gly, Asn, Ile, or His;

5   Xaa at position 54 is Leu, Val, Ile, Phe, or His;

Xaa at position 55 is Gln, Ala, Pro, Thr, Glu, Arg, or Gly;

Xaa at position 56 is Asn or Pro;

Xaa at position 57 is Ala, Met, Pro, Arg, Glu, Thr, or Gln;

Xaa at position 58 is Ser, Glu, Met, Ala, His, Asn, Arg, or Asp;

10   Xaa at position 59 is Ala, Glu, Asp, Leu, Ser, Gly, Thr, Arg, or

Pro;

Xaa at position 60 is Ile or Met;

Xaa at position 61 is Glu, Gly, Asp, Ser, or Gln;

Xaa at position 62 is Ser, Val, Ala, Asn, Glu, Pro, Gly, or

15   Asp;

Xaa at position 63 is Ile, Ser, or Leu;

Xaa at position 65 is Lys, Thr, Gly, Asn, Met, Arg, Ile, or

Asp;

Xaa at position 66 is Asn, Val, Gly, Thr, Leu, Glu, or Arg;

20   Xaa at position 67 is Leu or Val;

Xaa at position 68 is Leu, Gln, Trp, Arg, Asp, Ala, Asn, Glu,

His, Met, Phe, Ser, Thr, Tyr or Val;

Xaa at position 69 is Pro, Ala, Thr, Trp, or Met;

Xaa at position 71 is Leu or Val;

25   Xaa at position 73 is Leu or Ser;

Xaa at position 74 is Ala, Arg, or Trp;

Xaa at position 75 is Thr, Asp, Glu, His, Asn, or Ser;

Xaa at position 76 is Ala, Asp, or Met;

Xaa at position 77 is Ala, Pro, Ser, Thr, Phe, Leu, or Asp;

30   Xaa at position 78 is Pro or Ser;

Xaa at position 79 is Thr, Asp, Ser, Pro, Ala, Leu, or Arg;

Xaa at position 81 is His, Pro, Arg, Val, Leu, Gly, Asn, Ile,

Phe,

Ser or Thr;

35   Xaa at position 82 is Pro or Tyr;

Xaa at position 83 is Ile, Val, or Ala;

Xaa at position 84 is His, Ile, Asn, Leu, Asp, Ala, Thr,
    Arg, Gln, Glu, Lys, Met, Ser, Tyr, Val or Pro;

Xaa at position 85 is Ile, Leu, Val, or Phe;

Xaa at position 86 is Lys, Leu, His, Arg, Ile, Gln, Pro or

5   Ser;

Xaa at position 87 is Asp, Pro, Met, Lys, His, Thr, Val,
    Asn, Ile, Leu or Tyr;

Xaa at position 88 is Gly, Glu, Lys, or Ser;

Xaa at position 90 is Trp, Val, Tyr, Met, or Leu;

10 Xaa at position 91 is Asn, Pro, Ala, Phe, Ser, Trp, Gln, Tyr,
    Leu, Lys, Ile, Asp, or His;

Xaa at position 92 is Glu, Ser, Ala, or Gly;

Xaa at position 94 is Arg, Ala, Gln, Ser or Lys;

Xaa at position 95 is Arg, Thr, Glu, Leu, Ser, or Gly;

15 Xaa at position 98 is Thr, Val, Gln, Glu, His, or Ser;

Xaa at position 100 is Tyr or Trp;

Xaa at position 101 is Leu or Ala;

Xaa at position 102 is Lys, Thr, Met, Val, Trp, Ser, Leu,
    Ala, Asn, Gln, His, Met, Phe, Tyr or Ile;

20 Xaa at position 103 is Thr, Ser, or Asn;

Xaa at position 105 is Glu, Ser, Pro, Leu, Thr, or Tyr;

Xaa at position 106 is Asn, Pro, Leu, His, Val, or Gln;

Xaa at position 107 is Ala, Ser, Ile, Asn, Pro, Lys, Asp, or
    Gly;

25 Xaa at position 108 is Gln, Ser, Met, Trp, Arg, Phe, Pro, His,
    Ile, Tyr, or Cys;

Xaa at position 109 is Ala, Met, Glu, His, Ser, Pro, Tyr, or Leu;

and which can additionally have Met- or Met-Ala- preceding the

30 amino acid in position 1; and wherein from 4 to 44 of the amino
acids designated by Xaa are different from the corresponding
amino acids of native (1-133) human interleukin-3; or a
polypeptide having substantially the same structure and
substantially the same biological activity.

35

9.   A (15-125)human interleukin-3 mutant polypeptide

according to Claim 7 of the Formula VII:

Asn Cys Xaa Xaa Xaa Ile Xaa Glu Xaa Xaa Xaa Xaa Leu Lys Xaa
 1   5   10   15

Xaa Xaa Xaa Xaa Xaa Xaa Asp Xaa Xaa Asn Leu Asn Xaa Glu Xaa
             20   25   30

Xaa Xaa Ile Leu Met Xaa Xaa Asn Leu Xaa Xaa Xaa Asn Leu Glu
             35   40   45

Xaa Phe Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Asn Xaa Xaa Xaa Ile
             50   55   60

Glu Xaa Xaa Leu Xaa Xaa Leu Xaa Xaa Cys Xaa Pro Xaa Xaa Thr
             65   70   75

Ala Xaa Pro Xaa Arg Xaa Xaa Xaa Xaa Xaa Xaa Xaa Gly Asp Xaa
             80   85   90

Xaa Xaa Phe Xaa Xaa Lys Leu Xaa Phe Xaa Xaa Xaa Xaa Leu Glu
             95   100   105

Xaa Xaa Xaa Xaa Gln Gln [SEQ ID NO:21]
             110

wherein
Xaa at position 3 is Ser, Gly, Asp, Met, or Gln;
Xaa at position 4 is Asn, His, or Ile;
Xaa at position 5 is Met or Ile;
Xaa at position 7 is Asp or Glu;
Xaa at position 9 is Ile, Ala, Leu, or Gly;
Xaa at position 10 is Ile, Val, or Leu;
Xaa at position 11 is Thr, His, Gln, or Ala;
Xaa at position 12 is His or Ala;

Xaa at position 15 is Gln, Asn, or Val;

Xaa at position 16 is Pro, Gly, or Gln;

Xaa at position 17 is Pro, Asp, Gly, or Gln;

Xaa at position 18 is Leu, Arg, Gln, Asn, Gly, Ala, or Glu;

5   Xaa at position 19 is Pro or Glu;

Xaa at position 20 is Leu, Val, Gly, Ser, Lys, Ala, Arg,
        Gln, Glu, Ile, Phe, Thr or Met;

Xaa at position 21 is Leu, Ala, Asn, Pro, Gln, or Val;

Xaa at position 23 is Phe, Ser, Pro, or Trp;

10 Xaa at position 24 is Asn or Ala;

Xaa at position 28 is Gly, Asp, Ser, Cys, Ala, Asn, Ile,
        Leu, Met Tyr or Arg;

Xaa at position 30 is Asp or Glu;

Xaa at position 31 is Gln, Val, Met, Leu, Thr, Ala, Asn,

15   Glu, Ser or Lys;

Xaa at position 32 is Asp, Phe, Ser, Thr, Ala, Asn, Gln, Glu,
        His, Ile, Lys, Tyr, Val or Cys;

Xaa at position 36 is Glu, Ala, Asn, Ser or Asp;

Xaa at position 37 is Asn, Arg, Met, Pro, Ser, Thr, or His;

20 Xaa at position 40 is Arg or Ala;

Xaa at position 41 is Arg, Thr, Val, Leu, or Gly;

Xaa at position 42 is Pro, Gly, Ser, Gln, Ala, Arg, Asn, Glu,
Leu, Thr, Val   or Lys;

Xaa at position 46 is Ala or Ser;

25 Xaa at position 48 is Asn, Pro, Thr, or Ile;

Xaa at position 49 is Arg or Lys;

Xaa at position 50 is Ala or Asn;

Xaa at position 51 is Val or Thr;

Xaa at position 52 is Lys or Arg;

30 Xaa at position 53 is Ser, Phe, or His;

Xaa at position 54 is Leu, Ile, Phe, or His;

Xaa at position 55 is Gln, Ala, Pro, Thr, Glu, Arg, or Gly;

Xaa at position 57 is Ala, Pro, or Arg;

Xaa at position 58 is Ser, Glu, Arg, or Asp;

35 Xaa at position 59 is Ala or Leu;

Xaa at position 62 is Ser, Val, Ala, Asn, Glu, Pro, or Gly;

Xaa at position 63 is Ile or Leu;

Xaa at position 65 is Lys, Thr, Gly, Asn, Met, Arg, Ile, Gly, or
     Asp;

Xaa at position 66 is Asn, Gly, Glu, or Arg;

5   Xaa at position 68 is Leu, Gln, Trp, Arg, Asp, Ala, Asn, Glu,
     His, Ile, Met, Phe, Ser, Thr, Tyr or Val;

Xaa at position 69 is Pro or Thr;

Xaa at position 71 is Leu or Val;

Xaa at position 73 is Leu or Ser;

10 Xaa at position 74 is Ala or Trp;

Xaa at position 77 is Ala or Pro;

Xaa at position 79 is Thr, Asp, Ser, Pro, Ala, Leu, or Arg;

Xaa at position 81 is His, Pro, Arg, Val, Leu, Gly, Asn, Phe,
     Ser or Thr;

15 Xaa at position 82 is Pro or Tyr;

Xaa at position 83 is Ile or Val;

Xaa at position 84 is His, Ile, Asn, Leu, Ala, Thr, Leu, Arg,
     Gln, Leu, Lys, Met, Ser, Tyr, Val or Pro;

Xaa at position 85 is Ile, Leu, or Val;

20 Xaa at position 86 is Lys, Arg, Ile, Gln, Pro, or Ser;

Xaa at position 87 is Asp, Pro, Met, Lys, His, Thr, Asn, Ile,
     Leu or Tyr;

Xaa at position 90 is Trp or Leu;

Xaa at position 91 is Asn, Pro, Ala, Ser, Trp, Gln, Tyr, Leu,
25   Lys, Ile, Asp, or His;

Xaa at position 92 is Glu or Gly;

Xaa at position 94 is Arg, Ala, or Ser;

Xaa at position 95 is Arg, Thr, Glu, Leu, or Ser;

Xaa at position 98 is Thr, Val, or Gln;

30 Xaa at position 100 is Tyr or Trp;

Xaa at position 101 is Leu or Ala;

Xaa at position 102 is Lys, Thr, Val, Trp, Ser, Ala, His,
     Met, Phe, Tyr or Ile;

Xaa at position 103 is Thr or Ser;

35 Xaa at position 106 is Asn, Pro, Leu, His, Val, or Gln;

Xaa at position 107 is Ala, Ser, Ile, Asn, Pro, Asp, or Gly;

Xaa at position 108 is Gln, Ser, Met, Trp, Arg, Phe, Pro, His,
    Ile, Tyr, or Cys;
Xaa at position 109 is Ala, Met, Glu, His, Ser, Pro, Tyr, or Leu;

5   which can additionally have Met-.or Met-Ala- preceding the amino
acid in position 1; and wherein from 4 to 35 of the amino acids
designated by Xaa are different from the corresponding amino
acids of native human interleukin-3.

10   10. A (15-125)human interleukin-3 mutant polypeptide
according to Claim 7 of the Formula VIII:

Asn Cys Xaa Xaa Met Ile Asp Glu Xaa Ile Xaa Xaa Leu Lys Xaa
 1   5   10   15
15
Xaa Pro Xaa Pro Xaa Xaa Asp Phe Xaa Asn Leu Asn Xaa Glu Asp
             20   25   30

Xaa Xaa Ile Leu Met Xaa Xaa Asn Leu Arg Xaa Xaa Asn Leu Glu
20   35   40   45

Ala Phe Xaa Arg Xaa Xaa Lys Xaa Xaa Xaa Asn Ala Ser Ala Ile
             50   55   60

25 Glu Xaa Xaa Leu Xaa Xaa Leu Xaa Pro Cys Leu Pro Xaa Xaa Thr
             65   70   75

Ala Xaa Pro Xaa Arg Xaa Pro Ile Xaa Xaa Xaa Xaa Gly Asp Trp
             80   85   90

30
Xaa Glu Phe Xaa Xaa Lys Leu Xaa Phe Tyr Leu Xaa Xaa Leu Glu
             95 100   105

Xaa Xaa Xaa Xaa Gln Gln [SEQ ID NO:22]
35   110
wherein

Xaa at position 3 is Ser, Gly, Asp, or Gln;

Xaa at position 4 is Asn, His, or Ile;

Xaa at position 9 is Ile, Ala, Leu, or Gly;

Xaa at position 11 is Thr, His, or Gln;

5 Xaa at position 12 is His or Ala;

Xaa at position 15 is Gln or Asn;

Xaa at position 16 is Pro or Gly;

Xaa at position 18 is Leu, Arg, Asn, or Ala;

Xaa at position 20 is Leu, Val, Ser, Ala, Arg, Gln, Glu, Ile,

10   Phe, Thr or Met;

Xaa at position 21 is Leu, Ala, Asn, or Pro;

Xaa at position 24 is Asn or Ala;

Xaa at position 28 is Gly, Asp, Ser, Ala, Asn, Ile, Leu, Met,

          Tyr or Arg;

15 Xaa at position 31 is Gln, Val, Met, Leu, Ala, Asn, Glu or Lys;

Xaa at position 32 is Asp, Phe, Ser, Ala, Gln, Glu, His, Val

          or Thr;

Xaa at position 36 is Glu, Asn, Ser or Asp;

Xaa at position 37 is Asn, Arg, Pro, Thr, or His;

20 Xaa at position 41 is Arg, Leu, or Gly;

Xaa at position 42 is Pro, Gly, Ser, Ala, Asn, Val, Leu or Gln;

Xaa at position 48 is Asn, Pro, or Thr;

Xaa at position 50 is Ala or Asn;

Xaa at position 51 is Val or Thr;

25 Xaa at position 53 is Ser or Phe;

Xaa at position 54 is Leu or Phe;

Xaa at position 55 is Gln, Ala, Glu, or Arg;

Xaa at position 62 is Ser, Val, Asn, Pro, or Gly;

Xaa at position 63 is Ile or Leu;

30 Xaa at position 65 is Lys, Asn, Met, Arg, Ile, or Gly;

Xaa at position 66 is Asn, Gly, Glu, or Arg;

Xaa at position 68 is Leu, Gln, Trp, Arg, Asp, Asn, Glu, His,

          Met, Phe, Ser, Thr, Tyr or Val;

Xaa at position 73 is Leu or Ser;

35 Xaa at position 74 is Ala or Trp;

Xaa at position 77 is Ala or Pro;

Xaa at position 79 is Thr, Asp, or Ala;

Xaa at position 81 is His, Pro, Arg, Val, Gly, Asn, Ser or Thr;

Xaa at position 84 is His, Ile, Asn, Ala, Thr, Arg, Gln, Glu,
       Lys, Met, Ser, Tyr, Val or Leu;

5   Xaa at position 85 is Ile or Leu;

Xaa at position 86 is Lys or Arg;

Xaa at position 87 is Asp, Pro, Met, Lys, His, Pro, Asn, Ile, Leu
       or Tyr;

Xaa at position 91 is Asn, Pro, Ser, Ile or Asp;

10 Xaa at position 94 is Arg, Ala, or Ser;

Xaa at position 95 is Arg, Thr, Glu, Leu, or Ser;

Xaa at position 98 is Thr or Gln;

Xaa at position 102 is Lys, Val, Trp, or Ile;

Xaa at position 103 is Thr, Ala, His, Phe, Tyr or Ser;

15 Xaa at position 106 is Asn, Pro, Leu, His, Val, or Gln;

Xaa at position 107 is Ala, Ser, Ile, Pro, or Asp;

Xaa at position 108 is Gln, Met, Trp, Phe, Pro, His, Ile, or Tyr;

Xaa at position 109 is Ala, Met, Glu, Ser, or Leu;

20 and which can additionally have Met- or Met-Ala- preceding the
amino acid in position 1; and wherein from 4 to 26 of the amino
acids designated by Xaa are different from the corresponding
amino acids of native (1-133)human interleukin-3; or a
polypeptide having substantially the same structure and
25 substantially the same biological activity.

     11. A (15-125) human interleukin-3 mutant
polypeptide of claim 7 wherein:

30 Xaa at position 17 is Ser, Lys, Asp, Met, Gln, or Arg;

Xaa at position 18 is Asn, His, Leu, Ile, Phe, Arg, or Gln;

Xaa at position 19 is Met, Arg, Gly, Ala, or Cys;

Xaa at position 20 is Ile, Cys, Gln, Glu, Arg, Pro, or Ala;

Xaa at position 21 is Asp, Phe, Lys, Arg, Ala, Gly, or Val;

35 Xaa at position 22 is Glu, Trp, Pro, Ser, Ala, His, or Gly;

Xaa at position 23 is Ile, Ala, Gly, Trp, Lys, Leu, Ser, or Arg;

Xaa at position 24 is Ile, Gly, Arg, or Ser;

Xaa at position 25 is Thr, His, Gly, Gln, Arg, Pro, or Ala;

Xaa at position 26 is His, Thr, Phe, Gly, Ala, or Trp;

Xaa at position 27 is Leu, Gly, Arg, Thr, Ser, or Ala;

5 Xaa at position 28 is Lys, Leu, Gln, Gly, Pro, Val or Trp;

Xaa at position 29 is Gln, Asn, Loh, Pro, Arg, or Val;

Xaa at position 30 is Pro, His, Thr, Gly, Asp, Gln, Ser, Leu, or
Lys;

Xaa at position 31 is Pro, Asp, Gly, Arg, Leu, or Gln;

10 Xaa at position 32 is Leu, Arg, Gln, Asn, Gly, Ala, or Glu;

Xaa at position 33 is Pro, Leu, Gln, Thr, or Glu;

Xaa at position 34 is Leu, Gly, Ser, or Lys;

Xaa at position 35 is Leu, Ala, Gly, Asn, Pro, or Gln;

Xaa at position 36 is Asp, Leu, or Val;

15 Xaa at position 37 is Phe, Ser, or Pro;

Xaa at position 38 is Asn, or Ala;

Xaa at position 40 is Leu, Trp, or Arg;

Xaa at position 41 is Asn, Cys, Arg, Leu, His, Met, Pro;

Xaa at position 42 is Gly, Asp, Ser, Cys, or Ala;

20 Xaa at position 42 is Glu, Asn, Tyr, Leu, Phe, Asp, Ala, Cys, or
Ser;

Xaa at position 44 is Asp, Ser, Leu, Arg, Lys, Thr, Met, Trp, or
Pro;

Xaa at position 45 is Gln, Pro, Phe, Val, Met, Leu, Thr, Lys, or
25 Trp;

Xaa at position 46 is Asp, Phe, Ser, Thr, Cys, or Gly;

Xaa at position 47 is Ile, Gly, Ser, Arg, Pro, or His;

Xaa at position 48 is Leu, Ser, Cys, Arg, His, Phe, or Asn;

Xaa at position 49 is Met, Arg, Ala, Gly, Pro, Asn, His, or Asp;

30 Xaa at position 50 is Glu, Leu, Thr, Asp, or Tyr;

Xaa at position 51 is Asn, Arg, Met, Pro, Ser, Thr, or His;

Xaa at position 52 is Asn, His, Arg, Leu, Gly, Ser, or Thr;

Xaa at position 53 is Leu, Thr, Ala, Gly, Glu, Pro, Lys, Ser, or;

Xaa at position 54 is Arg, Asp, Ile, Ser, Val, Thr, Gln, or Leu;

35 Xaa at position 55 is Arg, Thr, Val, Ser, Leu, or Gly;

Xaa at position 56 is Pro, Gly, Cys, Ser, Gln, or Lys;

Xaa at position 57 is Asn or Gly;

Xaa at position 58 is Leu, Ser, Asp, Arg, Gln, Val, or Cys;

Xaa at position 59 is Glu Tyr, His, Leu, Pro, or Arg;

Xaa at position 60 is Ala, Ser, Tyr, Asn, or Thr;

5   Xaa at position 61 is Phe, Asn, Glu, Pro, Lys, Arg, or Ser;

Xaa at position 62 is Asn His, Val, Arg, Pro, Thr, or Ile;

Xaa at position 63 is Arg, Tyr, Trp, Ser, Pro, or Val;

Xaa at position 64 is Ala, Asn, Ser, or Lys;

Xaa at position 65 is Val, Thr, Pro, His, Leu, Phe, or Ser;

10   Xaa at position 66 is Lys, Ile, Val, Asn, Glu, or Ser;

Xaa at position 67 is Ser, Ala, Phe, Val, Gly, Asn, Ile, Pro, or His;

Xaa at position 68 is Leu, Val, Trp, Ser, Thr, or His;

Xaa at position 69 is Gln, Ala, Pro, Thr, Arg, Trp, Gly, or Leu;

15   Xaa at position 70 is Asn, Leu, Val, Trp, Pro, or Ala;

Xaa at position 71 is Ala, Met, Leu, Arg, Glu, Thr, Gln, Trp, or Asn;

Xaa at position 72 is Ser, Glu, Met, Ala, His, Asn, Arg, or Asp;

Xaa at position 73 is Ala, Glu, Asp, Leu, Ser, Gly, Thr, or Arg;

20   Xaa at position 74 is Ile, Thr, Pro, Arg, Gly, Ala;

Xaa at position 75 is Glu, Lys, Gly, Asp, Pro, Trp, Arg, Ser, or Leu;

Xaa at position 76 is Ser, Val, Ala, Asn, Trp, Glu, Pro, Gly, or Asp;

25   Xaa at position 77 is Ile, Ser, Arg, or Thr;

Xaa at position 78 is Leu, Ala, Ser, Glu, Gly, or Arg;

Xaa at position 79 is Lys, Thr, Gly, Asn, Met, Ile, or Asp;

Xaa at position 80 is Asn, Trp, Val, Gly, Thr, Leu, or Arg;

30   Xaa at position 81 is Leu, Gln, Gly, Ala, Trp, Arg, or Lys;

Xaa at position 82 is Leu, Gln, Lys, Trp, Arg, or Asp;

Xaa at position 83 is Pro, Thr, Trp, Arg, or Met;

Xaa at position 84 is Cys, Glu, Gly, Arg, Met, or Val;

Xaa at position 85 is Leu, Asn, or Gln;

35   Xaa at position 86 is Pro, Cys, Arg, Ala, or Lys;

Xaa at position 87 is Leu, Ser, Trp, or Gly;

Xaa at position 88 is Ala, Lys, Arg, Val, or Trp;

Xaa at position 89 is Thr, Asp, Cys, Leu, Val, Glu, His, or Asn;

Xaa at position 90 is Ala, Ser, Asp, Ile, or Met;

Xaa at position 91 is Ala, Ser, Thr, Phe, Leu, Asp, or His;

5   Xaa at position 92 is Pro, Phe, Arg, Ser, Lys, His, or Leu;

Xaa at position 93 is Thr, Asp, Ser, Asn, Pro, Ala, Leu, or Arg;

Xaa at position 94 is Arg, Ile, Ser, Glu, Leu, Val, or Pro;

Xaa at position 95 is His, Gln, Pro, Val, Leu, Thr or Tyr;

Xaa at position 96 is Pro, Lys, Tyr, Gly, Ile, or Thr;

10   Xaa at position 97 is Ile, Lys, Ala, or Asn;

Xaa at position 98 is His, Ile, Asn, Leu, Asp, Ala, Thr, or Pro;

Xaa at position 99 is Ile, Arg, Asp, Pro, Gln, Gly, Phe, or His;

Xaa at position 100 is Lys, Tyr, Leu, His, Ile, Ser, Gln, or Pro;

Xaa at position 101 is Asp, Pro, Met, Lys, His, Thr, Val, Tyr, or

15   Gln;

Xaa at position 102 is Gly, Leu, Glu, Lys, Ser, Tyr, or Pro;

Xaa at position 103 is Asp, or Ser;

Xaa at position 104 is Trp, Val, Cys, Tyr, Thr, Met, Pro, Leu,

     Gln, Lys, Ala, Phe, or Gly;

20   Xaa at position 105 is Asn, Pro, Ala, Phe, Ser, Trp, Gln, Tyr,

Leu, Lys, Ile, or His;

Xaa at position 106 is Glu, Ser, Ala, Lys, Thr, Ile, Gly, or Pro;

Xaa at position 108 is Arg, Asp, Leu, Thr, Ile, or Pro;

Xaa at position 109 is Arg, Thr, Pro, Glu, Tyr, Leu, Ser, or Gly.

25

12. The human interleukin-3 mutant polypetide of

claim 7:

        wherein;

30   Xaa at position 28 is Gly, Asp, Ser, Ile, Leu, Met, Tyr, or Ala;

Xaa at position 31 is Gln, Val, Met or Asn;

Xaa at position 32 is Asp, Ser, Ala, Gln, His or Val;

Xaa at position 36 is Glu or Asp;

Xaa at position 37 is Asn, Pro or Thr;

35   Xaa at position 48 is Asn or Pro;

Xaa at position 62 is Ser, or Pro;

Xaa at position 68 is Leu, Trp, Asp, Asn Glu, His, Phe, Ser or Tyr;

Xaa at position 81 is His, Arg, Thr, Asn or Ser;

Xaa at position 84 is His, Ile, Leu, Ala, Arg, Gln, Lys, Met,

5 Ser,

Tyr or Val;

Xaa at position 86 is Lys or Arg;

Xaa at position 87 is Asp, Pro, His, Asn, Ile or Leu;

Xaa at position 91 is Asn, or Pro;

10 Xaa at position 94 is Arg, Ala, or Ser;

Xaa at position 102 is Lys, Val, Trp, Ala, His, Phe, or Tyr;

Xaa at position 107 is Ala, or Ile;

Xaa at position 108 is Gln, or Ile; and

Xaa at position 109 is Ala, Met or Glu.

15

13. A polypeptide of the formula

```
             1              5                   10
(Met)m-Ala Pro Met Thr Gln Thr Thr Ser Leu Lys Thr
              15                  20
Ser Trp Val Asn Cys Ser Xaa Xaa Xaa Asp Glu Ile Ile
25                  30                  35
Xaa His Leu Lys Xaa Pro Pro Xaa Pro Xaa Leu Asp Xaa
              40                  45                  50
Xaa Asn Leu Asn Xaa Glu Asp Xaa Asp Ile Leu Xaa Glu
                   55                  60
Xaa Asn Leu Arg Xaa Xaa Asn Leu Xaa Xaa Phe Xaa Xaa
         65                  70                  75
Ala Xaa Lys Xaa Leu Xaa Asn Ala Ser Xaa Ile Glu Xaa
              80                  85
Ile Leu Xaa Asn Leu Xaa Pro Cys Xaa Pro Xaa Xaa Thr
90                  95                  100
Ala Xaa Pro Xaa Arg Xaa Pro Ile Xaa Ile Xaa Xaa Gly
         105                 110                 115
Asp Trp Xaa Glu Phe Arg Xaa Lys Leu Xaa Phe Tyr Leu
              120                 125
```

Xaa Xaa Leu Glu Xaa Ala Gln Xaa Gln Gln Thr Thr Leu
    130
Ser Leu Ala Ile Phe [SEQ ID NO:129]

5   wherein m is 0 or 1; Xaa at position 18 is Asn or Ile;
    Xaa at position 19 is Met, Ala or Ile; Xaa at position
    20 is Ile, Pro or Ile; Xaa at position 23 is Ile, Ala
    or Leu; Xaa at position 25 is Thr or His; Xaa at
    position 29 is Gln, Arg, Val or Ile; Xaa at position
10 32 is Leu, Ala, Asn or Arg; Xaa at position 34 is Leu
    or Ser; Xaa at position 37 is Phe, Pro, or Ser; Xaa at
    position 38 is Asn or Ala; Xaa at position 42 is Gly,
    Ala, Ser, Asp or Asn; Xaa at position 45 is Gln, Val,
    or Met; Xaa at position 46 is Asp or Ser; Xaa at
15 position 49 is Met, Ile, Leu or Asp; Xaa at position
    50 is Glu or Asp; Xaa at position 51 is Asn Arg or
    Ser; Xaa at position 55 is Arg, Leu, or Thr; Xaa at
    position 56 is Pro or Ser; Xaa at position 59 is Glu
    or Leu; Xaa at position 60 is Ala or Ser; Xaa at
20 position 62 is Asn, Val or Pro; Xaa at position 63 is
    Arg or His; Xaa at position 65 is Val or Ser; Xaa at
    position 67 is Ser, Asn, His or Gln; Xaa at position
    69 is Gln or Glu; Xaa at position 73 is Ala or Gly;
    Xaa at position 76 is Ser, Ala or Pro; Xaa at position
25 79 is Lys, Arg or Ser; Xaa at position 82 is Leu, Glu,
    Val or Trp; Xaa at position 85 is Leu or Val; Xaa at
    position 87 is Leu, Ser, Tyr; Xaa at position 88 is
    Ala or Trp; Xaa at position 91 is Ala or Pro; Xaa at
    position 93 is Pro or Ser; Xaa at position 95 is His
30 or Thr; Xaa at position 98 is His, Ile, or Thr; Xaa at
    position 100 is Lys or Arg; Xaa at position 101 is
    Asp, Ala or Met; Xaa at position 105 is Asn or Glu;
    Xaa at position 109 is Arg, Glu or Leu; Xaa at
    position 112 is Thr or Gln; Xaa at position 116 is
35 Lys, Val, Trp or Ser; Xaa at position 117 is Thr or
    Ser; Xaa at position 120 is Asn, Gln, or His; Xaa at

position 123 is Ala or Glu; with the proviso that from
four to forty-four of the amino acids designated by
Xaa are different from the corresponding amino acids
of native human interleukin-3; or a polypeptide having
5   substantially the same structure and substantially the
same biological activity.

14.   A polypeptide according to Claim 13
wherein Xaa at position 18 is Ile; Xaa at position 19
10   is Ala, or Ile; Xaa at position 20 is Pro, or Leu; Xaa
at position 23 is Ala, or Leu; Xaa at position 25 is
His; Xaa at position 29 is Arg, Val, or Ile; Xaa at
position 32 is Ala, Asn or Arg; Xaa at position 34 is
Ser; Xaa at position 37 is Pro or Ser; Xaa at position
15   38 is Ala; Xaa at position 42 is Ala, Ser, Asp, or
Asn; and Xaa at position 45 is Val or Met; Xaa at
position 46 is Ser.

15.   A polypeptide according to Claim 13
20   wherein Xaa at position 49 is Ile, or Leu, or Asp; Xaa
at position 50 is Asp; Xaa at position 51 is Arg or
Ser; Xaa at position 55 is Leu or Thr; Xaa at position
56 is Ser; Xaa at position 59 is Glu or Leu; Xaa at
position 60 is Ala or Ser; Xaa at position 62 is Val,
25   or Pro; Xaa at position 63 is His; Xaa at position 65
is Ser; Xaa at position 67 is Asn, or His, or Gln; and
Xaa at position 69 is Glu.

30   16.   A polypeptide according to Claim 13
wherein Xaa at position 73 is Gly; Xaa at position 76
is Ala, or Pro; Xaa at position 79 is Arg, or Ser; Xaa
at position 82 is Gln or Val, or Trp; Xaa at position
85 is Val; Xaa at position 87 is Ser, or Tyr; Xaa at
35   position 88 is Trp; Xaa at position 91 is Pro; Xaa at
position 93 is Ser; Xaa at position 95 is Thr; Xaa at

position 98 is Ile or Thr; Xaa at position 100 is Arg; Xaa at position 101 is Ala, or Met; and Xaa at position 105 is Glu.

5   17. A polypeptide according to Claim 13 wherein Xaa at position 109 is Glu, or Leu; Xaa at position 112 is Gln; Xaa at position 116 is Val, or Trp, or Ser; Xaa at position 117 is Ser; Xaa at position 120 is Glu or His; and Xaa at position 123 is

10 Glu.

           18. A polypeptide according to Claim 13 wherein Xaa at position 18 is Ile; Xaa at position 19 is Ala, or Ile; Xaa at position 20 is Pro, or Leu; Xaa

15 at position 23 is Ala, or Leu; Xaa at position 25 is His; Xaa at position 29 is Arg or Val, or Ile; Xaa at position 32 is Ala or Asn, or Arg; Xaa at position 34 is Ser; Xaa at position 37 is Pro or Ser; Xaa at position 38 is Ala; Xaa at position 42 is Ala or Ser,

20 Asp or Asn; Xaa at position 45 is Val or Met; Xaa at position 46 is Ser; Xaa at position 49 is Ile, or Leu, or Asp; Xaa at position 50 is Asp; Xaa at position 51 is Arg, or Ser; Xaa at position 55 is Leu or Thr; Xaa at position 56 is Ser; Xaa at position 59 is Glu or

25 Leu; Xaa at position 60 is Ala or Ser; Xaa at position 62 is Val, or Pro; Xaa at position 63 is His; Xaa at position 65 is Ser; Xaa at position 67 is Asn, or His, or Gln; and Xaa at position 69 is Glu.

30   19. A polypeptide according to Claim 13 wherein Xaa at position 73 is Gly; Xaa at position 76 is Ala, or Pro; Xaa at position 79 is Arg, or Ser; Xaa at position 82 is Gln or Val, or Trp; Xaa at position 85 is Val; Xaa at position 87 is Ser, or Tyr; Xaa at

35 position 88 is Trp; Xaa at position 91 is Pro; Xaa at position 93 is Ser; Xaa at position 95 is Thr; Xaa at

position 98 is Ile or Thr; Xaa at position 100 is Arg;
Xaa at position 101 is Ala, or Met; Xaa at position
105 is Glu; Xaa at position 109 is Glu, or Leu; Xaa at
position 112 is Gln; Xaa at position 116 is Val, or
5   Trp, or Ser; Xaa at position 117 is Ser; Xaa at
position 120 is Glu or His; and Xaa at position 123 is
Glu.

20.   A polypeptide of the formula

10
```
                  1              5                    10
(Met_m-Ala_n)_p-Asn Cys Ser Xaa Xaa Xaa Asp Glu Xaa Ile
                       15                      20
Xaa His Leu Lys Xaa Pro Pro Xaa Pro Xaa Leu Asp Xaa
```

15
```
       25                      30                      35
Xaa Asn Leu Asn Xaa Glu Asp Xaa Xaa Ile Leu Xaa Glu
              40                      45
Xaa Asn Leu Arg Xaa Xaa Asn Leu Xaa Xaa Phe Xaa Xaa
50                      55                      60
```
20
```
Ala Xaa Lys Xaa Leu Xaa Asn Ala Ser Xaa Ile Glu Xaa
       65                      70                      75
Ile Leu Xaa Asn Xaa Xaa Pro Cys Xaa Pro Xaa Ala Thr
              80                      85
Ala Xaa Pro Xaa Arg Xaa Pro Ile Xaa Ile Xaa Xaa Gly
```
25
```
       90                      95                     100
Asp Trp Xaa Glu Phe Arg Xaa Lys Leu Xaa Phe Tyr Leu
              105                     110
Xaa Xaa Leu Glu Xaa Ala Gln Xaa Gln Gln [SEQ ID
NO:130]
```
30

wherein m is 0 or 1; n is 0 or 1; p is 0 or 1; Xaa at
position 4 is Asn or Ile; Xaa at position 5 is Met,
Ala or Ile; Xaa at position 6 is Ile, Pro or Leu; Xaa
at position 9 is Ile, Ala or Leu; Xaa at position 11
35   is Thr or His; Xaa at position 15 is Gln, Arg, Val or
Ile; Xaa at position 18 is Leu, Ala, Asn or Arg; Xaa

at position 20 is Leu or Ser; Xaa at position 23 is
Phe, Pro, or Ser; Xaa at position 24 is Asn or Ala;
Xaa at position 28 is Gly, Ala, Ser, Asp or Asn; Xaa
at position 31 is Gln, Val, or Met; Xaa at position 32

5   is Asp or Ser; Xaa at position 35 is Met, Ile or Asp;
Xaa at position 36 is Glu or Asp; Xaa at position 37
is Asn, Arg or Ser; Xaa at position 41 is Arg, Leu, or
Thr; Xaa at position 42 is Pro or Ser; Xaa at position
45 is Glu or Leu; Xaa at position 46 is Ala or Ser;

10   Xaa at position 48 is Asn, Val or Pro; Xaa at position
49 is Arg or His; Xaa at position 51 is Val or Ser;
Xaa at position 53 is Ser, Asn, His or Gln; Xaa at
position 55 is Gln or Glu; Xaa at position 59 is Ala
or Gly; Xaa at position 62 is Ser, Ala or Pro; Xaa at

15   position 65 is Lys, Arg or Ser; Xaa at position 67 is
Leu, Glu, or Val; Xaa at position 68 is Leu, Glu, Val
or Trp; Xaa at position 71 is Leu or Val; Xaa at
position 73 is Leu, Ser or Tyr; Xaa at position 74 is
Ala or Trp; Xaa at position 77 is Ala or Pro; Xaa at

20   position 79 is Pro or Ser; Xaa at position 81 is His
or Thr; Xaa at position 84 is His, Ile, or Thr; Xaa at
position 86 is Lys or Arg; Xaa at position 87 is Asp,
Ala or Met; Xaa at position 91 is Asn or Glu; Xaa at
position 95 is Arg, Glu, Leu; Xaa at position 98 Thr

25   or Gln; Xaa at position 102 is Lys, Val, Trp or Ser;
Xaa at position 103 is Thr or Ser; Xaa at position 106
is Asn, Gln, or His; Xaa at position 109 is Ala or
Glu; with the proviso that from four to forty-four of
the amino acids designated by Xaa are different from

30   the corresponding amino acids of native (15-125)human
interleukin-3; or a polypeptide having substantially
the same structure and substantially the same
biological activity.

35   21. A polypeptide according to Claim 20
wherein Xaa at position 4 is Ile; Xaa at position 5 is

Ala, or Ile; Xaa at position 6 is Pro, or Leu; Xaa at position 9 is Ala, or Leu; Xaa at position 11 is His; Xaa at position 15 is Arg or Val, or Ile; Xaa at position 18 is Ala or Asn, or Arg; Xaa at position 20 is Ser; Xaa at position 23 is Pro or Ser; Xaa at position 24 is Ala; Xaa at position 28 is Ala or Ser, or Asp, or Asn; Xaa at position 31 is Val or Met; and Xaa at position 32 is Ser.

22. A polypeptide according to Claim 20 wherein Xaa at position 35 is Ile, or Leu, or Asp; Xaa at position 36 is Asp; Xaa at position 37 is Arg, or Ser; Xaa at position 41 is Leu or Thr; Xaa at position 42 is Ser; Xaa at position 45 is Glu or Leu; Xaa at position 46 is Ala or Ser; Xaa at position 48 is Val, or Pro; Xaa at position 49 is His; Xaa at position 51 is Ser; Xaa at position 53 is Asn, or His, or Gln; and Xaa at position 55 is Glu.

23. A polypeptide according to Claim 20 wherein Xaa at position 59 is Gly; Xaa at position 62 is Ala, or Pro; Xaa at position 65 is Arg, or Ser; Xaa at position 67 is Gln or Val; Xaa at position 68 is Glu, or Val, or Trp; Xaa at position 71 is Val; Xaa at position 73 is Ser, or Tyr; Xaa at position 74 is Trp; Xaa at position 77 is Pro; Xaa at position 79 is Ser; Xaa at position 81 is Thr; Xaa at position 84 is Ile or Thr; Xaa at position 86 is Arg; Xaa at position 87 is Ala, or Met; and Xaa at position 91 is Glu.

24. A polypeptide according to Claim 20 wherein Xaa at position 95 is Glu, or Leu; Xaa at position 98 is Gln; Xaa at position 102 is Val, or Trp, or Ser; Xaa at position 103 is Ser; Xaa at position 106 is Glu or His; and Xaa at position 109 is Glu.

25.   A polypeptide according to Claim 20 wherein Xaa at position 4 is Ile; Xaa at position 5 is Ala, or Ile; Xaa at position 6 is Pro, or Leu; Xaa at

5   position 9 is Ala, or Leu; Xaa at position 11 is His; Xaa at position 15 is Arg or Val, or Ile; Xaa at position 18 is Ala or Asn, or Arg; Xaa at position 20 is Ser; Xaa at position 23 is Pro or Ser; Xaa at position 24 is Ala; Xaa at position 28 is Ala or Ser,

10   or Asp, or Asn; Xaa at position 31 is Val or Met; Xaa at position 32 is Ser; Xaa at position 35 is Ile, or Leu, or Asp; Xaa at position 36 is Asp; Xaa at position 37 is Arg, or Ser; Xaa at position 41 is Leu or Thr; Xaa at position 42 is Ser; Xaa at position 45

15   is Glu or Leu; Xaa at position 46 is Ala or Ser; Xaa at position 48 is Val, or Pro; Xaa at position 49 is His; Xaa at position 51 is Ser; Xaa at position 53 is Asn, or His, or Gln; and Xaa at position 55 is Glu.

20   26.   A polypeptide according to Claim 20 wherein Xaa at position 59 is Gly; Xaa at position 62 is Ala, or Pro; Xaa at position 65 is Arg, or Ser; Xaa at position 67 is Gln or Val; Xaa at position 68 is Glu, or Val, or Trp; Xaa at position 71 is Val; Xaa at

25   position 73 is Ser, or Tyr; Xaa at position 74 is Trp; Xaa at position 77 is Pro; Xaa at position 79 is Ser; Xaa at position 81 is Thr; Xaa at position 84 is Ile or Thr; Xaa at position 86 is Arg; Xaa at position 87 is Ala, or Met; Xaa at position 91 is Glu; Xaa at

30   position 95 is Glu, or Lue; Xaa at position 98 is Gln; Xaa at position 102 is Val, or Trp, or Ser; Xaa at position 103 is Ser; Xaa at position 106 is Glu or His; and Xaa at position 109 is Glu.

35   27.   A polypeptide according to Claim 20 which is selected from

```
        Asn Cys Ser Ile Met Ile Asp Glu Ile Ile His His
    Leu
    Lys Arg Pro Pro Ala Pro Leu Leu Asp Pro Asn Asn Leu
    Asn Ala
  5 Glu Asp Val Asp Ile Leu Met Glu Asn Asn Leu Arg Arg
    Pro Asn
    Leu Glu Ala Phe Asn Arg Ala Val Lys Ser Leu Gln Asn
    Ala Ser
    Ala Ile Glu Ser Ile Leu Lys Asn Leu Leu Pro Cys Leu
 10 Pro Leu
    Ala Thr Ala Ala Pro Thr Arg His Pro Ile His Ile Lys
    Asp Gly
    Asp Trp Asn Glu Phe Arg Arg Lys Leu Thr Phe Tyr Leu
    Lys Thr
 15 Leu Glu Asn Ala Gln Ala Gln Gln [SEQ ID NO:66];


        Asn Cys Ser Ile Met Ile Asp Glu Ile Ile His His
    Leu Lys
    Arg Pro Pro Asn Pro Leu Leu Asp Pro Asn Asn Leu Asn
 20 Ser Glu
    Asp Met Asp Ile Leu Met Glu Asn Asn Leu Arg Arg Pro
    Asn Leu
    Glu Ala Phe Asn Arg Ala Val Lys Ser Leu Gln Asn Ala
    Ser Ala
 25 Ile Glu Ser Ile Leu Lys Asn Leu Leu Pro Cys Leu Pro
    Leu Ala
    Thr Ala Ala Pro Thr Arg His Pro Ile His Ile Lys Asp
    Gly Asp
    Trp Asn Glu Phe Arg Arg Lys Leu Thr Phe Tyr Leu Lys
 30 Thr Leu
    Glu Asn Ala Gln Ala Gln Gln [SEQ ID NO:67];


        Asn Cys Ser Ile Met Ile Asp Glu Ile Ile His His
    Leu Lys
 35 Val Pro Pro Ala Pro Leu Leu Asp Ser Asn Asn Leu Asn
    Ser Glu
```

```
   Asp Met Asp Ile Leu Met Glu Asn Asn Leu Arg Arg Pro
   Asn Leu
   Glu Ala Phe Asn Arg Ala Val Lys Ser Leu Gln Asn Ala
   Ser Ala
 5 Ile Glu Ser Ile Leu Lys Asn Leu Leu Pro Cys Leu Pro
   Leu Ala
   Thr Ala Ala Pro Thr Arg His Pro Ile His Ile Lys Asp
   Gly Asp
   Trp Asn Glu Phe Arg Arg Lys Leu Thr Phe Tyr Leu Lys
10 Thr Leu
   Glu Asn Ala Gln Ala Gln Gln [SEQ ID NO:68];


   Asn Cys Ser Asn Met Ile Asp Glu Ile Ile Thr His
   Leu Lys
15 Gln Pro Pro Leu Pro Leu Leu Asp Phe Asn Asn Leu Asn
   Gly Glu
   Asp Gln Asp Ile Leu Met Glu Arg Asn Leu Arg Leu Pro
   Asn Leu
   Leu Ala Phe Val Arg Ala Val Lys Asn Leu Glu Asn Ala
20 Ser Ala
   Ile Glu Ser Ile Leu Lys Asn Leu Leu Pro Cys Leu Pro
   Leu Ala
   Thr Ala Ala Pro Thr Arg His Pro Ile His Ile Lys Asp
   Gly Asp
25 Trp Asn Glu Phe Arg Arg Lys Leu Thr Phe Tyr Leu Lys
   Thr Leu
   Glu Asn Ala Gln Ala Gln Gln [SEQ ID NO:69];


   Asn Cys Ser Asn Met Ile Asp Glu Ile Ile Thr His
30 Leu Lys
   Gln Pro Pro Leu Pro Leu Leu Asp Phe Asn Asn Leu Asn
   Gly Glu
   Asp Gln Asp Ile Leu Met Glu Arg Asn Leu Arg Leu Pro
   Asn Leu
35 Glu Ser Phe Val Arg Ala Val Lys Asn Leu Glu Asn Ala
   Ser Ala
```

Ile Glu Ser Ile Leu Lys Asn Leu Leu Pro Cys Leu Pro
Leu Ala
Thr Ala Ala Pro Thr Arg His Pro Ile His Ile Lys Asp
Gly Asp
5   Trp Asn Glu Phe Arg Arg Lys Leu Thr Phe Tyr Leu Lys
Thr Leu
Glu Asn Ala Gln Ala Gln Gln [SEQ ID NO:70];

    Asn Cys Ser Asn Met Ile Asp Glu Ile Ile Thr His
10 Leu Lys
Gln Pro Pro Leu Pro Leu Leu Asp Phe Asn Asn Leu Asn
Gly Glu
Asp Gln Asp Ile Leu Met Glu Arg Asn Leu Arg Thr Pro
Asn Leu
15 Leu Ala Phe Val Arg Ala Val Lys His Leu Glu Asn Ala
Ser Ala
Ile Glu Ser Ile Leu Lys Asn Leu Leu Pro Cys Leu Pro
Leu Ala
Thr Ala Ala Pro Thr Arg His Pro Ile His Ile Lys Asp
20 Gly Asp
Trp Asn Glu Phe Arg Arg Lys Leu Thr Phe Tyr Leu Lys
Thr Leu
Glu Asn Ala Gln Ala Gln Gln [SEQ ID NO:71];

25   Asn Cys Ser Asn Met Ile Asp Glu Ile Ile Thr His
Leu Lys
Gln Pro Pro Leu Pro Leu Leu Asp Phe Asn Asn Leu Asn
Gly Glu
Asp Gln Asp Ile Leu Met Glu Asn Asn Leu Arg Arg Pro
30 Asn Leu
Glu Ala Phe Asn Arg Ala Val Lys Ser Leu Gln Asn Ala
Ser Gly
Ile Glu Ala Ile Leu Arg Asn Leu Gln Pro Cys Leu Pro
Ser Ala
35 Thr Ala Ala Pro Ser Arg His Pro Ile Ile Ile Lys Ala
Gly Asp

```
Trp Gln Glu Phe Arg Arg Lys Leu Thr Phe Tyr Leu Lys
Thr Leu
Glu Asn Ala Gln Ala Gln Gln [SEQ ID NO:72];
```

```
        Asn Cys Ser Asn Met Ile Asp Glu Ile Ile Thr His
Leu Lys
Gln Pro Pro Leu Pro Leu Leu Asp Phe Asn Asn Leu Asn
Gly Glu
Asp Gln Asp Ile Leu Met Glu Asn Asn Leu Arg Arg Pro
Asn Leu
Glu Ala Phe Asn Arg Ala Val Lys Ser Leu Gln Asn Ala
Ser Gly
Ile Glu Ala Ile Leu Arg Asn Leu Val Pro Cys Leu Pro
Ser Ala
Thr Ala Ala Pro Ser Arg His Pro Ile Thr Ile Lys Ala
Gly Asp
Trp Gln Glu Phe Arg Arg Lys Leu Thr Phe Tyr Leu Lys
Thr Leu
Glu Asn Ala Gln Ala Gln Gln [SEQ ID NO:73];
```

```
        Asn Cys Ser Asn Met Ile Asp Glu Ile Ile Thr His
Leu Lys
Gln Pro Pro Leu Pro Leu Leu Asp Phe Asn Asn Leu Asn
Gly Glu
Asp Gln Asp Ile Leu Met Glu Asn Asn Leu Arg Arg Pro
Asn Leu
Glu Ala Phe Asn Arg Ala Val Lys Ser Leu Gln Asn Ala
Ser Ala
Ile Glu Ser Ile Leu Lys Asn Leu Leu Pro Cys Leu Pro
Leu Ala
Thr Ala Ala Pro Thr Arg His Pro Ile His Ile Lys Asp
Gly Asp
Trp Asn Glu Phe Arg Glu Lys Leu Thr Phe Tyr Leu Val
Thr Leu
Glu Gln Ala Gln Glu Gln Gln [SEQ ID NO:74];
```

Asn Cys Ser Asn Met Ile Asp Glu Ile Ile Thr His
Leu Lys
Gln Pro Pro Leu Pro Leu Leu Asp Phe Asn Asn Leu Asn
Gly Glu
5 Asp Gln Asp Ile Leu Met Glu Asn Asn Leu Arg Arg Pro
Asn Leu
Glu Ala Phe Asn Arg Ala Val Lys Ser Leu Gln Asn Ala
Ser Ala
Ile Glu Ser Ile Leu Lys Asn Leu Leu Pro Cys Leu Pro
10 Leu Ala
Thr Ala Ala Pro Thr Arg His Pro Ile His Ile Lys Asp
Gly Asp
Trp Asn Glu Phe Arg Glu Lys Leu Thr Phe Tyr Leu Val
Ser Leu
15 Glu His Ala Gln Glu Gln Gln [SEQ ID NO:75];

Asn Cys Ser Asn Met Ile Asp Glu Ile Ile Thr His
Leu Lys
Gln Pro Pro Leu Pro Leu Leu Asp Phe Asn Asn Leu Asn
20 Gly Glu
Asp Gln Asp Ile Leu Met Glu Asn Asn Leu Arg Arg Pro
Asn Leu
Glu Ala Phe Asn Arg Ala Val Lys Ser Leu Gln Asn Ala
Ser Gly
25 Ile Glu Ala Ile Leu Arg Asn Leu Gln Pro Cys Leu Pro
Ser Ala
Thr Ala Ala Pro Ser Arg His Pro Ile Ile Ile Lys Ala
Gly Asp
Trp Gln Glu Phe Arg Glu Lys Leu Thr Phe Tyr Leu Val
30 Thr Leu
Glu Gln Ala Gln Glu Gln Gln [SEQ ID NO:76];

Asn Cys Ser Asn Met Ile Asp Glu Ile Ile Thr His
Leu Lys
35 Gln Pro Pro Leu Pro Leu Leu Asp Phe Asn Asn Leu Asn
Gly Glu

```
    Asp Gln Asp Ile Leu Met Glu Asn Asn Leu Arg Arg Pro
    Asn Leu
    Glu Ala Phe Asn Arg Ala Val Lys Ser Leu Gln Asn Ala
    Ser Gly
 5  Ile Glu Ala Ile Leu Arg Asn Leu Val Pro Cys Leu Pro
    Ser Ala
    Thr Ala Ala Pro Ser Arg His Pro Ile Thr Ile Lys Ala
    Gly Asp
    Trp Gln Glu Phe Arg Glu Lys Leu Thr Phe Tyr Leu Val
10  Thr Leu
    Glu Gln Ala Gln Glu Gln Gln [SEQ ID NO:77];

        Asn Cys Ser Asn Met Ile Asp Glu Ile Ile Thr His
    Leu Lys
15  Gln Pro Pro Leu Pro Leu Leu Asp Phe Asn Asn Leu Asn
    Gly Glu
    Asp Gln Asp Ile Leu Met Glu Asn Asn Leu Arg Arg Pro
    Asn Leu
    Glu Ala Phe Asn Arg Ala Val Lys Ser Leu Gln Asn Ala
20  Ser Gly
    Ile Glu Ala Ile Leu Arg Asn Leu Val Pro Cys Leu Pro
    Ser Ala
    Thr Ala Ala Pro Ser Arg His Pro Ile Thr Ile Lys Ala
    Gly Asp
25  Trp Gln Glu Phe Arg Glu Lys Leu Thr Phe Tyr Leu Val
    Ser Leu
    Glu His Ala Gln Glu Gln Gln [SEQ ID NO:78];

        Asn Cys Ser Ile Met Ile Asp Glu Ile Ile His His
30  Leu Lys
    Arg Pro Pro Ala Pro Leu Leu Asp Pro Asn Asn Leu Asn
    Ala Glu
    Asp Val Asp Ile Leu Met Glu Arg Asn Leu Arg Leu Pro
    Asn Leu
35  Glu Ser Phe Val Arg Ala Val Lys Asn Leu Glu Asn Ala
    Ser Ala
```

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     Ile Glu Ser Ile Leu Lys Asn Leu Leu Pro Cys Leu Pro
     Leu Ala
     Thr Ala Ala Pro Thr Arg His Pro Ile His Ile Lys Asp
     Gly Asp
  5  Trp Asn Glu Phe Arg Arg Lys Leu Thr Phe Tyr Leu Lys
     Thr Leu
     Glu Asn Ala Gln Ala Gln Gln [SEQ ID NO:79];


         Asn Cys Ser Ile Met Ile Asp Glu Ile Ile His His
 10  Leu Lys
     Arg Pro Pro Asn Pro Leu Leu Asp Pro Asn Asn Leu Asn
     Ser Glu
     Asp Met Asp Ile Leu Met Glu Arg Asn Leu Arg Thr Pro
     Asn Leu
 15  Leu Ala Phe Val Arg Ala Val Lys His Leu Glu Asn Ala
     Ser Ala
     Ile Glu Ser Ile Leu Lys Asn Leu Leu Pro Cys Leu Pro
     Leu Ala
     Thr Ala Ala Pro Thr Arg His Pro Ile His Ile Lys Asp
 20  Gly Asp
     Trp Asn Glu Phe Arg Arg Lys Leu Thr Phe Tyr Leu Lys
     Thr Leu
     Glu Asn Ala Gln Ala Gln Gln [SEQ ID NO:80];


 25      Asn Cys Ser Ile Met Ile Asp Glu Ile Ile His His
     Leu Lys
     Val Pro Pro Ala Pro Leu Leu Asp Ser Asn Asn Leu Asn
     Ser Glu
     Asp Met Asp Ile Leu Met Glu Arg Asn Leu Arg Leu Pro
 30  Asn Leu
     Leu Ala Phe Val Arg Ala Val Lys Asn Leu Glu Asn Ala
     Ser Ala
     Ile Glu Ser Ile Leu Lys Asn Leu Leu Pro Cys Leu Pro
     Leu Ala
 35  Thr Ala Ala Pro Thr Arg His Pro Ile His Ile Lys Asp
     Gly Asp
```

Trp Asn Glu Phe Arg Arg Lys Leu Thr Phe Tyr Leu Lys
Thr Leu
Glu Asn Ala Gln Ala Gln Gln [SEQ ID NO:81];

5   Met Ala Asn Cys Ser Asn Met Ile Asp Glu Ile Ile Thr
His Leu
Lys Gln Pro Pro Leu Pro Leu Leu Asp Phe Asn Asn Leu
Asn Gly
Glu Asp Gln Asp Ile Leu Met Glu Asn Asn Leu Arg Arg
10 Pro Asn
Leu Glu Ala Phe Asn Arg Ala Val Lys Ser Leu Gln Asn
Ala Ser
Gly Ile Glu Ala Ile Leu Arg Asn Leu Gln Pro Cys Leu
Pro Ser
15 Ala Thr Ala Ala Pro Ser Arg His Pro Ile Ile Ile Lys
Ala Gly
Asp Trp Gln Glu Phe Arg Glu Lys Leu Thr Phe Tyr Leu
Val Thr
Leu Glu Gln Ala Gln Glu Gln Gln [SEQ ID NO:82];
20

Met Ala Asn Cys Ser Asn Met Ile Asp Glu Ile Ile Thr
His Leu
Lys Gln Pro Pro Leu Pro Leu Leu Asp Phe Asn Asn Leu
Asn Gly
25 Glu Asp Gln Asp Ile Leu Met Glu Asn Asn Leu Arg Arg
Pro Asn
Leu Glu Ala Phe Asn Arg Ala Val Lys Ser Leu Gln Asn
Ala Ser
Gly Ile Glu Ala Ile Leu Arg Asn Leu Val Pro Cys Leu
30 Pro Ser
Ala Thr Ala Ala Pro Ser Arg His Pro Ile Thr Ile Lys
Ala Gly
Asp Trp Gln Glu Phe Arg Glu Lys Leu Thr Phe Tyr Leu
Val Thr
35 Leu Glu Gln Ala Gln Glu Gln Gln [SEQ ID NO:83];

```
     Met Ala Asn Cys Ser Asn Met Ile Asp Glu Ile Ile Thr
     His Leu
     Lys Gln Pro Pro Leu Pro Leu Leu Asp Phe Asn Asn Leu
     Asn Gly
  5  Glu Asp Gln Asp Ile Leu Met Glu Asn Asn Leu Arg Arg
     Pro Asn
     Leu Glu Ala Phe Asn Arg Ala Val Lys Ser Leu Gln Asn
     Ala Ser
     Gly Ile Glu Ala Ile Leu Arg Asn Leu Val Pro Cys Leu
 10  Pro Ser
     Ala Thr Ala Ala Pro Ser Arg His Pro Ile Thr Ile Lys
     Ala Gly
     Asp Trp Gln Glu Phe Arg Glu Lys Leu Thr Phe Tyr Leu
     Val Ser
 15  Leu Glu His Ala Gln Glu Gln Gln [SEQ ID NO:84];

     Met Ala Asn Cys Ser Ile Met Ile Asp Glu Ile Ile His
     His Leu
     Lys Arg Pro Pro Ala Pro Leu Leu Asp Pro Asn Asn Leu
     Asn Ala
 20  Glu Asp Val Asp Ile Leu Met Glu Arg Asn Leu Arg Leu
     Pro Asn
     Leu Glu Ser Phe Val Arg Ala·Val Lys Asn Leu Glu Asn
     Ala Ser
 25  Ala Ile Glu Ser Ile Leu Lys Asn Leu Leu Pro Cys Leu
     Pro Leu
     Ala Thr Ala Ala Pro Thr Arg His Pro Ile His Ile Lys
     Asp Gly
     Asp Trp Asn Glu Phe Arg Arg Lys Leu Thr Phe Tyr Leu
 30  Lys Thr
     Leu Glu Asn Ala Gln Ala Gln Gln [SEQ ID NO:85];

     Met Ala Asn Cys Ser Ile Met Ile Asp Glu Ile Ile His
     His Leu
 35  Lys Arg Pro Pro Asn Pro Leu Leu Asp Pro Asn Asn Leu
     Asn Ser
```

```
   Glu Asp Met Asp Ile Leu Met Glu Arg Asn Leu Arg Thr
   Pro Asn
   Leu Leu Ala Phe Val Arg Ala Val Lys His Leu Glu Asn
   Ala Ser
5  Ala Ile Glu Ser Ile Leu Lys Asn Leu Leu Pro Cys Leu
   Pro Leu
   Ala Thr Ala Ala Pro Thr Arg His Pro Ile His Ile Lys
   Asp Gly
   Asp Trp Asn Glu Phe Arg Arg Lys Leu Thr Phe Tyr Leu
10 Lys Thr
   Leu Glu Asn Ala Gln Ala Gln Gln [SEQ ID NO:86];

   Met Ala Asn Cys Ser Ile Met Ile Asp Glu Ile Ile His
   His Leu
15 Lys Val Pro Pro Ala Pro Leu Leu Asp Ser Asn Asn Leu
   Asn Ser
   Glu Asp Met Asp Ile Leu Met Glu Arg Asn Leu Arg Leu
   Pro Asn
   Leu Leu Ala Phe Val Arg Ala Val Lys Asn Leu Glu Asn
20 Ala Ser
   Ala Ile Glu Ser Ile Leu Lys Asn Leu Leu Pro Cys Leu
   Pro Leu
   Ala Thr Ala Ala Pro Thr Arg His Pro Ile His Ile Lys
   Asp Gly
25 Asp Trp Asn Glu Phe Arg Arg Lys Leu Thr Phe Tyr Leu
   Lys Thr
   Leu Glu Asn Ala Gln Ala Gln Gln [SEQ ID NO:87];

   Met Ala Asn Cys Ser Ile Met Ile Asp Glu Ile Ile His
30 His Leu
   Lys Arg Pro Pro Ala Pro Leu Leu Asp Pro Asn Asn Leu
   Asn Ala
   Glu Asp Val Asp Ile Leu Met Glu Arg Asn Leu Arg Leu
   Pro Asn
35 Leu Glu Ser Phe Val Arg Ala Val Lys Asn Leu Glu Asn
   Ala Ser
```

```
    Gly Ile Glu Ala Ile Leu Arg Asn Leu Gln Pro Cys Leu
    Pro Ser
    Ala Thr Ala Ala Pro Ser Arg His Pro Ile Ile Ile Lys
    Ala Gly
 5  Asp Trp Gln Glu Phe Arg Glu Lys Leu Thr Phe Tyr Leu
    Val Thr
    Leu Glu Gln Ala Gln Glu Gln Gln [SEQ ID NO:88];


    Met Ala Asn Cys Ser Ile Met Ile Asp Glu Ile Ile His
10  His Leu
    Lys Arg Pro Pro Asn Pro Leu Leu Asp Pro Asn Asn Leu
    Asn Ser
    Glu Asp Met Asp Ile Leu Met Glu Arg Asn Leu Arg Thr
    Pro Asn
15  Leu Leu Ala Phe Val Arg Ala Val Lys His Leu Glu Asn
    Ala Ser
    Gly Ile Glu Ala Ile Leu Arg Asn Leu Gln Pro Cys Leu
    Pro Ser
    Ala Thr Ala Ala Pro Ser Arg His Pro Ile Ile Ile Lys
20  Ala Gly
    Asp Trp Gln Glu Phe Arg Glu Lys Leu Thr Phe Tyr Leu
    Val Thr
    Leu Glu Gln Ala Gln Glu Gln Gln [SEQ ID NO:89];

25  Met Ala Asn Cys Ser Ile Met Ile Asp Glu Ile Ile His
    His Leu
    Lys Val Pro Pro Ala Pro Leu Leu Asp Ser Asn Asn Leu
    Asn Ser
    Glu Asp Met Asp Ile Leu Met Glu Arg Asn Leu Arg Leu
30  Pro Asn
    Leu Leu Ala Phe Val Arg Ala Val Lys Asn Leu Glu Asn
    Ala Ser
    Gly Ile Glu Ala Ile Leu Arg Asn Leu Gln Pro Cys Leu
    Pro Ser
35  Ala Thr Ala Ala Pro Ser Arg His Pro Ile Ile Ile Lys
    Ala Gly
```

Asp Trp Gln Glu Phe Arg Glu Lys Leu Thr Phe Tyr Leu
Val Thr
Leu Glu Gln Ala Gln Glu Gln Gln [SEQ ID NO:90];

5 Met Ala Asn Cys Ser Ile Met Ile Asp Glu Ile Ile His
His Leu
Lys Arg Pro Pro Ala Pro Leu Leu Asp Pro Asn Asn Leu
Asn Ala
Glu Asp Val Asp Ile Leu Met Glu Arg Asn Leu Arg Leu
10 Pro Asn
Leu Glu Ser Phe Val Arg Ala Val Lys Asn Leu Glu Asn
Ala Ser
Gly Ile Glu Ala Ile Leu Arg Asn Leu Val Pro Cys Leu
Pro Ser
15 Ala Thr Ala Ala Pro Ser Arg His Pro Ile Thr Ile Lys
Ala Gly
Asp Trp Gln Glu Phe Arg Glu Lys Leu Thr Phe Tyr Leu
Val Thr
Leu Glu Gln Ala Gln Glu Gln Gln [SEQ ID NO:91];
20

Met Ala Asn Cys Ser Ile Met Ile Asp Glu Ile Ile His
His Leu
Lys Val Pro Pro Ala Pro Leu Leu Asp Ser Asn Asn Leu
Asn Ser
25 Glu Asp Met Asp Ile Leu Met Glu Arg Asn Leu Arg Leu
Pro Asn
Leu Leu Ala Phe Val Arg Ala Val Lys Asn Leu Glu Asn
Ala Ser
Gly Ile Glu Ala Ile Leu Arg Asn Leu Val Pro Cys Leu
30 Pro Ser
Ala Thr Ala Ala Pro Ser Arg His Pro Ile Thr Ile Lys
Ala Gly
Asp Trp Gln Glu Phe Arg Glu Lys Leu Thr Phe Tyr Leu
Val Thr
35 Leu Glu Gln Ala Gln Glu Gln Gln [SEQ ID NO:92];

Met Ala Asn Cys Ser Ile Met Ile Asp Glu Ile Ile His
His Leu

Lys Arg Pro Pro Asn Pro Leu Leu Asp Pro Asn Asn Leu
Asn Ser

5   Glu Asp Met Asp Ile Leu Met Glu Arg Asn Leu Arg Thr
Pro Asn

Leu Leu Ala Phe Val Arg Ala Val Lys His Leu Glu Asn
Ala Ser

Gly Ile Glu Ala Ile Leu Arg Asn Leu Val Pro Cys Leu
10   Pro Ser

Ala Thr Ala Ala Pro Ser Arg His Pro Ile Thr Ile Lys
Ala Gly

Asp Trp Gln Glu Phe Arg Glu Lys Leu Thr Phe Tyr Leu
Val Ser

15   Leu Glu His Ala Gln Glu Gln Gln [SEQ ID NO:93];

Met Ala Asn Cys Ser Ile Met Ile Asp Glu Ile Ile His
His Leu

Lys Val Pro Pro Ala Pro Leu Leu Asp Ser Asn Asn Leu
20   Asn Ser

Glu Asp Met Asp Ile Leu Met Glu Arg Asn Leu Arg Leu
Pro Asn

Leu Leu Ala Phe Val Arg Ala Val Lys Asn Leu Glu Asn
Ala Ser

25   Gly Ile Glu Ala Ile Leu Arg Asn Leu Val Pro Cys Leu
Pro Ser

Ala Thr Ala Ala Pro Ser Arg His Pro Ile Thr Ile Lys
Ala Gly

Asp Trp Gln Glu Phe Arg Glu Lys Leu Thr Phe Tyr Leu
30   Val Ser

Leu Glu His Ala Gln Glu Gln Gln [SEQ ID NO:94];

Met Ala Asn Cys Ser Ile Met Ile Asp Glu Ile Ile His
His Leu

35   Lys Arg Pro Pro Asn Pro Leu Leu Asp Pro Asn Asn Leu
Asn Ser

```
   Glu Asp Met Asp Ile Leu Met Glu Arg Asn Leu Arg Thr
   Pro Asn
   Leu Leu Ala Phe Val Arg Ala Val Lys His Leu Glu Asn
   Ala Ser
 5 Gly Ile Glu Ala Ile Leu Arg Asn Leu Val Pro Cys Leu
   Pro Ser
   Ala Thr Ala Ala Pro Ser Arg His Pro Ile Thr Ile Lys
   Ala Gly
   Asp Trp Gln Glu Phe Arg Glu Lys Leu Thr Phe Tyr Leu
10 Val Thr
   Leu Glu Gln Ala Gln Glu Gln Gln [SEQ ID NO:95]; and

   Met Ala Asn Cys Ser Ile Met Ile Asp Glu Ile Ile His
   His Leu
15 Lys Arg Pro Pro Ala Pro Leu Leu Asp Pro Asn Asn Leu
   Asn Ala
   Glu Asp Val Asp Ile Leu Met Glu Arg Asn Leu Arg Leu
   Pro Asn
   Leu Glu Ser Phe Val Arg Ala Val Lys Asn Leu Glu Asn
20 Ala Ser
   Gly Ile Glu Ala Ile Leu Arg Asn Leu Val Pro Cys Leu
   Pro Ser
   Ala Thr Ala Ala Pro Ser Arg His Pro Ile Thr Ile Lys
   Ala Gly
25 Asp Trp Gln Glu Phe Arg Glu Lys Leu Thr Phe Tyr Leu
   Val Ser
   Leu Glu His Ala Gln Glu Gln Gln [SEQ ID NO:96].

30 Met Ala Asn Cys Ser Ile Met Ile Asp Glu Ile Ile His
   His Leu

   Lys Arg Pro Pro Ala Pro Leu Leu Asp Pro Asn Asn Leu
   Asn Ala
35
   Glu Asp Val Asp Ile Leu Met Asp Arg Asn Leu Arg Leu
   Ser Asn

   Leu Glu Ser Phe Val Arg Ala Val Lys Asn Leu Glu Asn
40 Ala Ser
```

```
    Gly Ile Glu Ala Ile Leu Arg Asn Leu Gln Pro Cys Leu
    Pro Ser

 5  Ala Thr Ala Ala Pro Ser Arg His Pro Ile Ile Ile Lys
    Ala Gly

    Asp Trp Gln Glu Phe Arg Glu Lys Leu Thr Phe Tyr Leu
    Val Thr
10
    Leu Glu Gln Ala Gln Glu Gln Gln [SEQ ID NO.: 296]

    Met Ala Asn Cys Ser Ile Met Ile Asp Glu Ala Ile His
    His Leu
15
    Lys Arg Pro Pro Ala Pro Ser Leu Asp Pro Asn Asn Leu
    Asn Asp

    Glu Asp Met Ser Ile Leu Met Glu Arg Asn Leu Arg Leu
20  Pro Asn

    Leu Glu Ser Phe Val Arg Ala Val Lys Asn Leu Glu Asn
    Ala Ser

25  Gly Ile Glu Ala Ile Leu Arg Asn Leu Gln Pro Cys Leu
    Pro Ser

    Ala Thr Ala Ala Pro Ser Arg His Pro Ile Ile Ile Lys
    Ala Gly
30
    Asp Trp Gln Glu Phe Arg Glu Lys Leu Thr Phe Tyr Leu
    Val Thr

    Leu Glu Gln Ala Gln Glu Gln Gln [SEQ ID NO.: 300]
35


    Met Ala Asn Cys Ser Ile Met Ile Asp Glu Ile Ile His
    His Leu
40
    Lys Arg Pro Pro Ala Pro Leu Leu Asp Pro Asn Asn Leu
    Asn Asp

    Glu Asp Met Ser Ile Leu Met Glu Arg Asn Leu Arg Leu
45  Pro Asn

    Leu Glu Ser Phe Val Arg Ala Val Lys Asn Leu Glu Asn
    Ala Ser

50  Gly Ile Glu Ala Ile Leu Arg Asn Leu Gln Pro Cys Leu
```

```
     Pro Ser

     Ala Thr Ala Ala Pro Ser Arg His Pro Ile Ile Ile Lys
     Ala Gly
 5
     Asp Trp Gln Glu Phe Arg Glu Lys Leu Thr Phe Tyr Leu
     Val Thr

     Leu Glu Gln Ala Gln Glu Gln Gln [SEQ ID NO.: 301]
10
     Met Ala Asn Cys Ser Ile Met Ile Asp Glu Ile Ile His
     His Leu

     Lys Arg Pro Pro Ala Pro Leu Leu Asp Pro Asn Asn Leu
15   Asn Ala

     Glu Asp Val Asp Ile Leu Met Asp Arg Asn Leu Arg Leu
     Pro Asn

20   Leu Glu Ser Phe Val Arg Ala Val Lys Asn Leu Glu Asn
     Ala Ser

     Gly Ile Glu Ala Ile Leu Arg Asn Leu Gln Pro Cys Leu
     Pro Ser
25
     Ala Thr Ala Ala Pro Ser Arg His Pro Ile Ile Ile Lys
     Ala Gly

     Asp Trp Gln Glu Phe Arg Glu Lys Leu Thr Phe Tyr Leu
30   Val Thr

     Leu Glu Gln Ala Gln Glu Gln Gln [SEQ ID NO.: 308]

35   Met Ala Asn Cys Ser Ile Met Ile Asp Glu Ile Ile His
     His Leu

     Lys Arg Pro Pro Ala Pro Leu Leu Asp Pro Asn Asn Leu
     Asn Asp
40
     Glu Asp Val Ser Ile Leu Met Glu Arg Asn Leu Arg Leu
     Pro Asn

     Leu Glu Ser Phe Val Arg Ala Val Lys Asn Leu Glu Asn
45   Ala Ser

     Gly Ile Glu Ala Ile Leu Arg Asn Leu Gln Pro Cys Leu
     Pro Ser

50   Ala Thr Ala Ala Pro Ser Arg His Pro Ile Ile Ile Lys
```

```
     Ala Gly

     Asp Trp Gln Glu Phe Arg Glu Lys Leu Thr Phe Tyr Leu
     Val Thr
 5
     Leu Glu Gln Ala Gln Glu Gln Gln [SEQ ID NO.: 309]


     Met Ala Asn Cys Ser Ile Met Ile Asp Glu Ile Ile His
10   His Leu

     Lys Arg Pro Pro Ala Pro Leu Leu Asp Pro Asn Asn Leu
     Asn Asp

15   Glu Asp Met Ser Ile Leu Met Glu Arg Asn Leu Arg Leu
     Pro Asn

     Leu Glu Ser Phe Val Arg Ala Val Lys Asn Leu Glu Asn
     Ala Ser
20
     Gly Ile Glu Ala Ile Leu Arg Asn Leu Gln Pro Cys Leu
     Pro Ser

     Ala Thr Ala Ala Pro Ser Arg His Pro Ile Ile Ile Lys
25   Ala Gly

     Asp Trp Gln Glu Phe Arg Glu Lys Leu Thr Phe Tyr Leu
     Val Thr

30   Leu Glu Gln Ala Gln Glu Gln Gln [SEQ ID NO.: 310]

     Met Ala Tyr Pro Glu Thr Asp Tyr Lys Asp Asp Asp Asp
     Lys Asn

35   Cys Ser Ile Met Ile Asp Glu Ile Ile His His Leu Lys
     Arg Pro

     Pro Ala Pro Leu Leu Asp Pro Asn Asn Leu Asn Ala Glu
     Asp Val
40
     Asp Ile Leu Met Glu Arg Asn Leu Arg Leu Pro Asn Leu
     Glu Ser

     Phe Val Arg Ala Val Lys Asn Leu Glu Asn Ala Ser Gly
45   Ile Glu

     Ala Ile Leu Arg Asn Leu Gln Pro Cys Leu Pro Ser Ala
     Thr Ala

50   Ala Pro Ser Arg His Pro Ile Ile Ile Lys Ala Gly Asp
```

Trp Gln

Glu Phe Arg Glu Lys Leu Thr Phe Tyr Leu Val Thr Leu
Glu Gln

5

Ala Gln Glu Gln Gln [SEQ ID NO.: 315]

Met Ala Tyr Pro Glu Thr Asp Tyr Lys Asp Asp Asp Asp
10 Lys Asn

Cys Ser Ile Met Ile Asp Glu Ile Ile His His Leu Lys
Arg Pro

15 Pro Asn Pro Leu Leu Asp Pro Asn Asn Leu Asn Ser Glu
Asp Met

Asp Ile Leu Met Glu Arg Asn Leu Arg Thr Pro Asn Leu
Leu Ala
20

Phe Val Arg Ala Val Lys His Leu Glu Asn Ala Ser Gly
Ile Glu

Ala Ile Leu Arg Asn Leu Gln Pro Cys Leu Pro Ser Ala
25 Thr Ala

Ala Pro Ser Arg His Pro Ile Ile Ile Lys Ala Gly Asp
Trp Gln

30 Glu Phe Arg Glu Lys Leu Thr Phe Tyr Leu Val Thr Leu
Glu Gln

Ala Gln Glu Gln Gln [SEQ ID NO.: 316]

35 Met Ala Asn Cys Ser Ile Met Ile Asp Glu Leu Ile His
His Leu

Lys Ile Pro Pro Asn Pro Ser Leu Asp Ser Ala Asn Leu
Asn Ser
40

Glu Asp Val Ser Ile Leu Met Glu Arg Asn Leu Arg Thr
Pro Asn

Leu Leu Ala Phe Val Arg Ala Val Lys His Leu Glu Asn
45 Ala Ser

Gly Ile Glu Ala Ile Leu Arg Asn Leu Gln Pro Cys Leu
Pro Ser

50 Ala Thr Ala Ala Pro Ser Arg His Pro Ile Ile Ile Lys

Ala Gly

Asp Trp Gln Glu Phe Arg Glu Lys Leu Thr Phe Tyr Leu Val Thr

5

Leu Glu Gln Ala Gln Glu Gln Gln [SEQ ID NO.: 318]

    28. A pharmaceutical composition for the treatment of hematopoietic cell deficiencies
10 comprising a therapeutically effective amount of a mutant human interleukin-3 polypeptide selected from the group consisting of a polypeptide of claim 1, a polypeptide of claim 2, a polypeptide of claim 3, a polypeptide of claim 4, a polypeptide of claim 5, a
15 polypeptide of claim 6, a polypeptide of claim 7, a polypeptide of claim 8, a polypeptide of claim 9, a polypeptide of claim 10, a polypeptide of claim 11, a polypeptide of claim 12, a polypeptide of claim 13, a polypeptide of claim 14, a polypeptide of claim 15, a
20 polypeptide of claim 16, a polypeptide of claim 17; a polypeptide of claim 18, a polypeptide of claim 19, a polypeptide of claim 20, a polypeptide of claim 21, a polypeptide of claim 22, a polypeptide of claim 23, a polypeptide of claim 24, a polypeptide of claim 25, a
25 polypeptide of claim 26 and a polypeptide of claim 27, and a pharmaceutically acceptable carrier.

    29. A pharmaceutical composition according
30 to Claim 28 for the treatment of hematopoietic cell deficiencies comprising a therapeutically effective amount of a polypeptide having an amino acid sequence corresponding to SEQ ID NO:88 and a pharmaceutically acceptable carrier.
35

    30. A pharmaceutical composition according to Claim 28 for the treatment of hematopoietic cell deficiencies comprising a therapeutically effective

amount of a polypeptide having an amino acid sequence corresponding to SEQ ID NO:89 and a pharmaceutically acceptable carrier.

5   31. A pharmaceutical composition according to Claim 28 for the treatment of hematopoietic cell deficiencies comprising a therapeutically effective amount of a polypeptide having an amino acid sequence corresponding to SEQ ID NO:90 and a pharmaceutically
10   acceptable carrier.

          32. A pharmaceutical composition according to Claim 28 for the treatment of hematopoietic cell deficiencies comprising a therapeutically effective
15   amount of a polypeptide selected from the group consisting of

          a polypeptide having an amino acid sequence corresponding to SEQ ID NO:66;
20

          a polypeptide having an amino acid sequence corresponding to SEQ ID NO:67;

          a polypeptide having an amino acid sequence corresponding
25   to SEQ ID NO:68;

          a polypeptide having an amino acid sequence corresponding to SEQ ID NO:69;

30   a polypeptide having an amino acid sequence corresponding to SEQ ID NO:70;

          a polypeptide having an amino acid sequence corresponding to SEQ ID NO:71;
35

          a polypeptide having an amino acid sequence corresponding

to SEQ ID NO:72;

a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:73;

5

a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:74;

a polypeptide having an amino acid sequence corresponding
10   to SEQ ID NO:75;

a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:76;

15   a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:77;

a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:78;

20

a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:79;

a polypeptide having an amino acid sequence corresponding
25   to SEQ ID NO:80;

a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:81;

30   a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:82;

a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:83;

35

a polypeptide having an amino acid sequence corresponding

to SEQ ID NO:84;

a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:85;

5

a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:86;

a polypeptide having an amino acid sequence corresponding
10   to SEQ ID NO:87;

a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:91;

15   a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:92;

a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:93;

20

a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:94;

a polypeptide having an amino acid sequence corresponding
25   to SEQ ID NO:95;

a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:96;

30   a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:258;

a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:259;

35

a polypeptide having an amino acid sequence corresponding

to SEQ ID NO:260;

a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:261;

5

a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:262;

a polypeptide having an amino acid sequence corresponding

10   to SEQ ID NO:263;

a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:278;

15   a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:279;

a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:314;

20

a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:315;

a polypeptide having an amino acid sequence corresponding

25   to SEQ ID NO:316;

a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:264;

30   a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:265;

a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:266;

35

a polypeptide having an amino acid sequence corresponding

to SEQ ID NO:267;

a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:268;

5

a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:269;

a polypeptide having an amino acid sequence corresponding
10   to SEQ ID NO:270;

a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:271;

15   a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:272;

a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:273;

20

a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:274;

a polypeptide having an amino acid sequence corresponding
25   to SEQ ID NO:275;

a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:276;

30

a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:277;

a polypeptide having an amino acid sequence corresponding
35   to SEQ ID NO:280;

a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:281;

a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:282;

a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:283;

a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:284;

a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:285;

a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:286;

a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:287;

a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:288;

a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:289;

a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:299;

a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:300;

a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:301;

a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:302;

5   a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:303;

a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:304;

10

a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:305;

a polypeptide having an amino acid sequence corresponding
15   to SEQ ID NO:306;

a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:307;

20   a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:308;

a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:309;

25

a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:310;

a polypeptide having an amino acid sequence corresponding
30   to SEQ ID NO:311;

a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:312;

35

a polypeptide having an amino acid sequence corresponding

to SEQ ID NO:313;

a polypeptide having an amino acid sequence corresponding to SEQ ID NO:314;

5

a polypeptide having an amino acid sequence corresponding to SEQ ID NO:317;

a polypeptide having an amino acid sequence corresponding

10 to SEQ ID NO:318;

a polypeptide having an amino acid sequence corresponding to SEQ ID NO:319;

15 a polypeptide having an amino acid sequence corresponding to SEQ ID NO:320;

a polypeptide having an amino acid sequence corresponding to SEQ ID NO:321;

20

a polypeptide having an amino acid sequence corresponding to SEQ ID NO:322;

a polypeptide having an amino acid sequence corresponding

25 to SEQ ID NO:323;

a polypeptide having an amino acid sequence corresponding to SEQ ID NO:324;

30 a polypeptide having an amino acid sequence corresponding to SEQ ID NO:325;

a polypeptide having an amino acid sequence corresponding

35 to SEQ ID NO:326;

and a pharmaceutically acceptable carrier.

33. A method of stimulating the production
of hematopoietic cells which comprises administering a
5   therapeutically effective amount of a mutant human
interleukin-3 polypeptide selected from the group consisting of a
polypeptide of claim 1, a polypeptide of claim 2, a polypeptide
of claim 3, a polypeptide of claim 4, a polypeptide of claim 5, a
polypeptide of claim 6, a polypeptide of claim 7, a polypeptide
10   of claim 8, a polypeptide of claim 9, a polypeptide of claim 10,
a polypeptide of claim 11, a polypeptide of claim 12, a
polypeptide of claim 13, a polypeptide of claim 14, a polypeptide
of claim 15, a polypeptide of claim 16, a polypeptide of claim
17; a polypeptide of claim 18, a polypeptide of claim 19, a
15   polypeptide of claim 20, a polypeptide of claim 21, a polypeptide
of claim 22, a polypeptide of claim 23, a polypeptide of claim
24, a polypeptide of claim 25, a polypeptide of claim 26, a
polypeptide of claim 27, to a patient in need of such
treatment.
20

34. A method according to claim 33 of
stimulating the production of hematopoietic cells
which comprises administering a therapeutically
effective amount of a polypeptide having an amino acid
25   sequence corresponding to SEQ ID NO:88.

35. A method according to claim 33 of
stimulating the production of hematopoietic cells
which comprises administering a therapeutically
30   effective amount of a polypeptide having an amino acid
sequence corresponding to SEQ ID NO:89.

36. A method according to claim 33 of
stimulating the production of hematopoietic cells
35   which comprises administering a therapeutically
effective amount of a polypeptide having an amino acid

sequence corresponding to SEQ ID NO:90.

  37. A method according to claim 33 of stimulating the production of hematopoietic cells which comprises administering a therapeutically effective amount of a polypeptide selected from the group consisting of

  a polypeptide having an amino acid sequence corresponding to SEQ ID NO:66;

  a polypeptide having an amino acid sequence corresponding to SEQ ID NO:67;

  a polypeptide having an amino acid sequence corresponding to SEQ ID NO:68;

  a polypeptide having an amino acid sequence corresponding to SEQ ID NO:69;

  a polypeptide having an amino acid sequence corresponding to SEQ ID NO:70;

  a polypeptide having an amino acid sequence corresponding to SEQ ID NO:71;

  a polypeptide having an amino acid sequence corresponding to SEQ ID NO:72;

  a polypeptide having an amino acid sequence corresponding to SEQ ID NO:73;

  a polypeptide having an amino acid sequence corresponding to SEQ ID NO:74;

  a polypeptide having an amino acid sequence corresponding

to SEQ ID NO:75;

a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:76;

a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:77;

a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:78;

a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:79;

a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:80;

a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:81;

a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:82;

a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:83;

a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:84;

a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:85;

a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:86;

a polypeptide having an amino acid sequence corresponding

364

to SEQ ID NO:87;

a polypeptide having an amino acid sequence corresponding to SEQ ID NO:91;

5

a polypeptide having an amino acid sequence corresponding to SEQ ID NO:92;

a polypeptide having an amino acid sequence corresponding

10   to SEQ ID NO:93;

a polypeptide having an amino acid sequence corresponding to SEQ ID NO:94;

15   a polypeptide having an amino acid sequence corresponding to SEQ ID NO:95;

a polypeptide having an amino acid sequence corresponding to SEQ ID NO:96;

20

a polypeptide having an amino acid sequence corresponding to SEQ ID NO:258;

a polypeptide having an amino acid sequence corresponding

25   to SEQ ID NO:259;

a polypeptide having an amino acid sequence corresponding to SEQ ID NO:260;

30   a polypeptide having an amino acid sequence corresponding to SEQ ID NO:261;

a polypeptide having an amino acid sequence corresponding to SEQ ID NO:262;

35

a polypeptide having an amino acid sequence corresponding

to SEQ ID NO:263;

a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:278;

a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:279;

a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:314;

a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:315;

a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:316;

a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:264;

a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:265;

a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:266;

a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:267;

a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:268;

a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:269;

a polypeptide having an amino acid sequence corresponding to SEQ ID NO:270;

a polypeptide having an amino acid sequence corresponding to SEQ ID NO:271;

a polypeptide having an amino acid sequence corresponding to SEQ ID NO:272;

a polypeptide having an amino acid sequence corresponding to SEQ ID NO:273;

a polypeptide having an amino acid sequence corresponding to SEQ ID NO:274;

a polypeptide having an amino acid sequence corresponding to SEQ ID NO:275;

a polypeptide having an amino acid sequence corresponding to SEQ ID NO:276;

a polypeptide having an amino acid sequence corresponding to SEQ ID NO:277;

a polypeptide having an amino acid sequence corresponding to SEQ ID NO:280;

a polypeptide having an amino acid sequence corresponding to SEQ ID NO:281;

a polypeptide having an amino acid sequence corresponding to SEQ ID NO:282;

a polypeptide having an amino acid sequence corresponding to SEQ ID NO:283;

a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:284;

5

a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:285;

a polypeptide having an amino acid sequence corresponding
10   to SEQ ID NO:286;

a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:287;

15   a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:288;

a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:289;

20

a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:299;

a polypeptide having an amino acid sequence corresponding
25   to SEQ ID NO:300;

a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:301;

30   a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:302;

a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:303;

35

a polypeptide having an amino acid sequence corresponding

to SEQ ID NO:304;

a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:305;

a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:306;

a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:307;

a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:308;

a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:309;

a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:310;

a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:311;

a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:312;

a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:313;

a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:314;

a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:317;

a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:318;

a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:319;

a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:320;

a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:321;

a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:322;

a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:323;

a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:324;

a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:325;

a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:326;

to a patient in need of such treatment.

38. A recombinant DNA sequence comprising
vector DNA and a DNA that encodes a polypeptide selected
from the group consisting of a polypeptide of claim 1, a
polypeptide of claim 2, a polypeptide of claim 3, a polypeptide
of claim 4, a polypeptide of claim 5, a polypeptide of claim 6, a
polypeptide of claim 7, a polypeptide of claim 8, a polypeptide

of claim 9, a polypeptide of claim 10, a polypeptide of claim 11,
a polypeptide of claim 12, a polypeptide of claim 13, a
polypeptide of claim 14, a polypeptide of claim 15, a polypeptide
of claim 16, a polypeptide of claim 17; a polypeptide of claim

5   18, a polypeptide of claim 19, a polypeptide of claim 20, a
polypeptide of claim 21, a polypeptide of claim 22, a polypeptide
of claim 23, a polypeptide of claim 24, a polypeptide of claim
25, a polypeptide of claim 26, or a polypeptide of claim 27,.

10   39.   A recombinant DNA sequence according to
Claim 38 comprising vector DNA and a DNA having a
nucleotide sequence corresponding to SEQ ID NO:97.

           40.   A recombinant DNA sequence according to
15   Claim 38 comprising vector DNA and a DNA having a
nucleotide sequence corresponding to SEQ ID NO:100 or
103.

           41.   A recombinant DNA sequence according to
20   Claim 38 comprising vector DNA and a DNA having a
nucleotide sequence corresponding to SEQ ID NO:161.

           42.   A recombinant DNA sequence according to
Claim 38 comprising vector DNA and a DNA selected from
25

        a DNA having a nucleotide sequence corresponding to SEQ ID
        NO:98;

        a DNA having a nucleotide sequence corresponding to SEQ ID
30   NO:99;

        a DNA having a nucleotide sequence corresponding to SEQ ID
        NO:101;

35   a DNA having a nucleotide sequence corresponding to SEQ ID
        NO:102;

a DNA having a nucleotide sequence corresponding to SEQ ID NO:104;

a DNA having a nucleotide sequence corresponding to SEQ ID NO:105;

a DNA having a nucleotide sequence corresponding to SEQ ID NO:106;

a DNA having a nucleotide sequence corresponding to SEQ ID NO:107;

a DNA having a nucleotide sequence corresponding to SEQ ID NO:108;

a DNA having a nucleotide sequence corresponding to SEQ ID NO:109;

a DNA having a nucleotide sequence corresponding to SEQ ID NO:110;

a DNA having a nucleotide sequence corresponding to SEQ ID NO:111;

a DNA having a nucleotide sequence corresponding to SEQ ID NO:112;

a DNA having a nucleotide sequence corresponding to SEQ ID NO:113;

a DNA having a nucleotide sequence corresponding to SEQ ID NO:114;

a DNA having a nucleotide sequence corresponding to SEQ ID

NO:115;

a DNA having a nucleotide sequence corresponding to SEQ ID NO:116;

a DNA having a nucleotide sequence corresponding to SEQ ID NO:117;

a DNA having a nucleotide sequence corresponding to SEQ ID NO:118;

a DNA having a nucleotide sequence corresponding to SEQ ID NO:119;

a DNA having a nucleotide sequence corresponding to SEQ ID NO:120;

a DNA having a nucleotide sequence corresponding to SEQ ID NO:121;

a DNA having a nucleotide sequence corresponding to SEQ ID NO:122;

a DNA having a nucleotide sequence corresponding to SEQ ID NO:123;

a DNA having a nucleotide sequence corresponding to SEQ ID NO:124;

a DNA having a nucleotide sequence corresponding to SEQ ID NO:125;

a DNA having a nucleotide sequence corresponding to SEQ ID NO:126;

a DNA having a nucleotide sequence corresponding to SEQ ID NO:127;

a DNA having a nucleotide sequence corresponding to SEQ ID NO:160;

a DNA having a nucleotide sequence corresponding to SEQ ID NO:161;

a DNA having a nucleotide sequence corresponding to SEQ ID NO:398;

a DNA having a nucleotide sequence corresponding to SEQ ID NO:399;

a DNA having a nucleotide sequence corresponding to SEQ ID NO:346;

a DNA having a nucleotide sequence corresponding to SEQ ID NO:347

a DNA having a nucleotide sequence corresponding to SEQ ID NO:303

a DNA having a nucleotide sequence corresponding to SEQ ID NO:404

a DNA having a nucleotide sequence corresponding to SEQ ID NO:405

a DNA having a nucleotide sequence corresponding to SEQ ID NO:332

a DNA having a nucleotide sequence corresponding to SEQ ID NO:333

a DNA having a nucleotide sequence corresponding to SEQ ID NO:334

5   a DNA having a nucleotide sequence corresponding to SEQ ID NO:335

a DNA having a nucleotide sequence corresponding to SEQ ID NO:336

10

a DNA having a nucleotide sequence corresponding to SEQ ID NO:337

15   a DNA having a nucleotide sequence corresponding to SEQ ID NO:338

a DNA having a nucleotide sequence corresponding to SEQ ID NO:339

20

a DNA having a nucleotide sequence corresponding to SEQ ID NO:340

a DNA having a nucleotide sequence corresponding to SEQ ID

25   NO:341

a DNA having a nucleotide sequence corresponding to SEQ ID NO:342

30   a DNA having a nucleotide sequence corresponding to SEQ ID NO:343

a DNA having a nucleotide sequence corresponding to SEQ ID NO:344

35

a DNA having a nucleotide sequence corresponding to SEQ ID

NO:345

a DNA having a nucleotide sequence corresponding to SEQ ID
NO:348

5

a DNA having a nucleotide sequence corresponding to SEQ ID
NO:349

a DNA having a nucleotide sequence corresponding to SEQ ID
10   NO:350

a DNA having a nucleotide sequence corresponding to SEQ ID
NO:352

15

a DNA having a nucleotide sequence corresponding to SEQ ID
NO:353

a DNA having a nucleotide sequence corresponding to SEQ ID
20   NO:354

a DNA having a nucleotide sequence corresponding to SEQ ID
NO:355

25   a DNA having a nucleotide sequence corresponding to SEQ ID
NO:356

a DNA having a nucleotide sequence corresponding to SEQ ID
NO:357

30

a DNA having a nucleotide sequence corresponding to SEQ ID
NO:358

a DNA having a nucleotide sequence corresponding to SEQ ID
35   NO:359

a DNA having a nucleotide sequence corresponding to SEQ ID NO:360

a DNA having a nucleotide sequence corresponding to SEQ ID NO:361

a DNA having a nucleotide sequence corresponding to SEQ ID NO:362

a DNA having a nucleotide sequence corresponding to SEQ ID NO:363

a DNA having a nucleotide sequence corresponding to SEQ ID NO:364

a DNA having a nucleotide sequence corresponding to SEQ ID NO:365

a DNA having a nucleotide sequence corresponding to SEQ ID NO:366

a DNA having a nucleotide sequence corresponding to SEQ ID NO:367

a DNA having a nucleotide sequence corresponding to SEQ ID NO:368

a DNA having a nucleotide sequence corresponding to SEQ ID NO:369

a DNA having a nucleotide sequence corresponding to SEQ ID NO:370

a DNA having a nucleotide sequence corresponding to SEQ ID NO:371

a DNA having a nucleotide sequence corresponding to SEQ ID NO:372

5   a DNA having a nucleotide sequence corresponding to SEQ ID NO:373

a DNA having a nucleotide sequence corresponding to SEQ ID NO:374

10

a DNA having a nucleotide sequence corresponding to SEQ ID NO:375

a DNA having a nucleotide sequence corresponding to SEQ ID
15   NO:376

a DNA having a nucleotide sequence corresponding to SEQ ID NO:377

20

a DNA having a nucleotide sequence corresponding to SEQ ID NO:378

a DNA having a nucleotide sequence corresponding to SEQ ID
25   NO:379

a DNA having a nucleotide sequence corresponding to SEQ ID NO:380

30   a DNA having a nucleotide sequence corresponding to SEQ ID NO:381

a DNA having a nucleotide sequence corresponding to SEQ ID NO:382

35

a DNA having a nucleotide sequence corresponding to SEQ ID

NO:384

a DNA having a nucleotide sequence corresponding to SEQ ID
NO:385

5

a DNA having a nucleotide sequence corresponding to SEQ ID
NO:386

a DNA having a nucleotide sequence corresponding to SEQ ID
10   NO:387

a DNA having a nucleotide sequence corresponding to SEQ ID
NO:388

15   a DNA having a nucleotide sequence corresponding to SEQ ID
NO:389

a DNA having a nucleotide sequence corresponding to SEQ ID
20   NO:390

a DNA having a nucleotide sequence corresponding to SEQ ID
NO:391

25   a DNA having a nucleotide sequence corresponding to SEQ ID
NO:392

43.   A host cell containing a recombinant
30   DNA sequence of claim 38 and capable of expressing the
encoded polypeptide.

44.   A host cell of claim 43 containing a
recombinant DNA vector comprising vector DNA and a DNA
35   having a nucleotide sequence corresponding to SEQ ID
NO:97 and capable of expressing the encoded

polypeptide.

45.   A host cell of claim 43 containing a
recombinant DNA vector comprising vector DNA and a DNA
5   having a nucleotide sequence corresponding to SEQ ID
NO:100 or 103 and capable of expressing the encoded
polypeptide.

46.   A host cell of claim 43 containing a
10   recombinant DNA vector comprising vector DNA and a DNA
having a nucleotide sequence corresponding to SEQ ID
NO:161 and capable of expressing the encoded
polypeptide.

15   47.   A method of producing a mutant human
interleukin-3 polypeptide comprising the steps of:

(a) culturing a host cell containing a
recombinant DNA sequence comprising vector DNA
20   and a DNA sequence of Claim 38 and capable of
expressing the encoded polypeptide under
conditions permitting expression of the
recombinant DNA; and

25   (b) harvesting the polypeptide from the culture.

48.   A method according to Claim 47 of
producing a mutant human interleukin-3 polypeptide
comprising the steps of:
30
(a) culturing a host cell containing a
recombinant DNA sequence comprising vector DNA
and a DNA having a nucleotide sequence
corresponding to SEQ ID NO:97 and capable of
35   expressing the encoded polypeptide under
conditions permitting expression of the

recombinant DNA; and

(b) harvesting the polypeptide from the culture.

5   49.   A method according to Claim 47 of
producing a mutant human interleukin-3 polypeptide
comprising the steps of:

(a) culturing a host cell containing a
10   recombinant DNA sequence comprising vector DNA
and a DNA having a nucleotide sequence
corresponding to SEQ ID NO:100 or 103 and capable
of expressing the encoded polypeptide under
conditions permitting expression of the
15   recombinant DNA; and

(b) harvesting the polypeptide from the culture.

50.   A method according to Claim 47 of
20 producing a mutant human interleukin-3 polypeptide
comprising the steps of:

(a) culturing a host cell containing a
recombinant DNA sequence comprising vector DNA
25   and a DNA having a nucleotide sequence
corresponding to SEQ ID NO:161 and capable of
expressing the encoded polypeptide under
conditions permitting expression of the
recombinant DNA; and
30

(b) harvesting the polypeptide from the culture.

51.   A vector containing a gene having a DNA
sequence selected from the group consisting of:
35

a DNA having a nucleotide sequence corresponding

to SEQ ID NO:97;

a DNA having a nucleotide sequence corresponding
to SEQ ID NO:100;

a DNA having a nucleotide sequence corresponding
to SEQ ID NO:103;

a DNA having a nucleotide sequence corresponding
to SEQ ID NO:160;

a DNA having a nucleotide sequence corresponding
to SEQ ID NO:161;

a DNA having a nucleotide sequence corresponding
to SEQ ID NO:404;

a DNA having a nucleotide sequence corresponding
to SEQ ID NO:405;

a DNA having a nucleotide sequence corresponding
to SEQ ID NO:364;

a DNA having a nucleotide sequence corresponding
to SEQ ID NO:368;

a DNA having a nucleotide sequence corresponding
to SEQ ID NO:369;

a DNA having a nucleotide sequence corresponding
to SEQ ID NO:376;

a DNA having a nucleotide sequence corresponding
to SEQ ID NO:377;

a DNA having a nucleotide sequence corresponding to SEQ ID NO:378;

5

a DNA having a nucleotide sequence corresponding to SEQ ID NO:385;

52. A recombinant DNA vector comprising a
10 promoter, a ribosome binding site, and a signal peptide directly linked to a DNA sequence encoding a polypeptide selected from the group consisting of

a polypeptide having an amino acid sequence
15 corresponding to SEQ ID NO:88;

a polypeptide having an amino acid sequence corresponding to SEQ ID NO:89; and

20 a polypeptide having an amino acid sequence corresponding to SEQ ID NO:90;

said vector being capable of directing expression of said mutant human interleukin-3 polypeptide.
25

53. A recombinant DNA vector according to Claim 51 wherein the promoter is AraBAD.

54. A recombinant DNA vector according to
30 Claim 51 wherein the ribosome binding site is g10-L.

55. A recombinant DNA vector according to Claim 51 wherein the signal peptide is a lamB signal peptide.
35

56. A recombinant DNA vector according to

Claim 51 wherein the signal peptide is the lamB signal
peptide depicted in Figure 8.

5   57. A recombinant DNA vector according to
Claim 51 wherein the promoter is AraBAD and the
ribosome binding site is g10-L.

          58. A recombinant DNA vector according to
10   Claim 51 wherein the promoter is AraBAD, the ribosome
binding site is g10-L, and the signal peptide is a
lamB signal peptide.

          59. A recombinant DNA vector according to
15   Claim 51 wherein the promoter is AraBAD, the ribosome
binding site is g10-L, and the signal peptide is the
lamB signal peptide depicted in Figure 8.

          60. A recombinant bacterial host which
20   comprises the vector of Claim 51 wherein said host
secretes a mutant human interleukin-3 polypeptide
selected from the group consisting of
     a polypeptide having an amino acid sequence
     corresponding to SEQ ID NO:88;
25

     a polypeptide having an amino acid sequence
     corresponding to SEQ ID NO:89; and

     a polypeptide having an amino acid sequence
30   corresponding to SEQ ID NO:90.

          61. A polypeptide of the formula
             1   5   10
(Met)$_m$-Ala Pro Met Thr Gln Thr Thr Ser Leu Lys Thr

35
          15   20

```
      Ser Trp Val Asn Cys Ser Xaa Met Ile Asp Glu Ile Ile
      25                  30              35

      Xaa His Leu Lys Xaa Pro Pro Xaa Pro Leu Leu Asp Xaa
              40                  45                  50

   5  Asn Asn Leu Asn Xaa Glu Asp Xaa Asp Ile Leu Met Glu
                      55                  60

      Xaa Asn Leu Arg Xaa Pro Asn Leu Xaa Xaa Phe Xaa Arg
              65                  70                  75

      Ala Val Lys Xaa Leu Xaa Asn Ala Ser Xaa Ile Glu Xaa
  10              80                  85

      Ile Leu Xaa Asn Leu Xaa Pro Cys Leu Pro Xaa Ala Thr
      90                  95                  100

      Ala Ala Pro Xaa Arg His Pro Ile Xaa Ile Lys Xaa Gly
              105                 110                 115

  15  Asp Trp Xaa Glu Phe Arg Xaa Lys Leu Thr Phe Tyr Leu
                      120                 125

      Xaa Thr Leu Glu Xaa Ala Gln Xaa Gln Gln Thr Thr Leu
              130

      Ser Leu Ala Ile Phe  [SEQ ID NO:129]
  20
```

wherein m is 0 or 1; Xaa at position 18 is Asn or Ile;
Xaa at position 25 is Thr or His; Xaa at position 29
is Gln, Arg, or Val; Xaa at position 32 is Leu, Ala,
or Asn; Xaa at position 37 is Phe, Pro, or Ser; Xaa at
25 position 42 is Glu, Ala, or Ser; Xaa at position 45 is
Gln, Val, or Met; Xaa at position 51 is Asn or Arg;
Xaa at position 55 is Arg, Leu, or Thr; Xaa at
position 59 is Glu or Leu; Xaa at position 60 is Ala
or Ser; Xaa at position 62 is Asn or Val; Xaa at
30 position 67 is Ser, Asn, or His; Xaa at position 69 is
Gln or Glu; Xaa at position 73 is Ala or Gly; Xaa at
position 76 is Ser or Ala; Xaa at position 79 is Lys
or Arg; Xaa at position 82 is Leu, Glu, or Val; Xaa at
position 87 is Leu or Ser; Xaa at position 93 is Pro
35 or Ser; Xaa at position 98 is His, Ile, or Thr; Xaa at
position 101 is Asp or Ala; Xaa at position 105 is Asn

or Glu; Xaa at position 109 is Arg or Glu; Xaa at
position 116 is Lys or Val; Xaa at position 120 is
Asn, Gln, or His; Xaa at position 123 is Ala or Glu;
with the proviso that from four to twenty-seven of the

5 amino acids designated by Xaa are different from the
corresponding amino acids of native human interleukin-
3 and wherein from 1 to 14 of amino acids 1 to 14 has
been deleted from the N-terminus and/or from 1 to 15
of amino acids 119 to 133 has been deleted from the C-

10 terminus of the polypeptide; or a polypeptide having
substantially the same structure and substantially the
same biological activity.

      62.   A method according to Claim 47 of
15 producing a mutant human interleukin-3 polypeptide
comprising the steps of:

      (a) culturing a host cell containing a
      recombinant DNA sequence comprising vector DNA
20   and a DNA having a nucleotide sequence
      corresponding to SEQ ID NO:160 and capable of
      expressing the encoded polypeptide under
      conditions permitting expression of the
      recombinant DNA; and

25

      (b) harvesting the polypeptide from the culture.

      63.   A method according to Claim 47 of
producing a mutant human interleukin-3 polypeptide
30 comprising the steps of:

      (a) culturing a host cell containing a
      recombinant DNA sequence comprising vector DNA
      and a DNA having a nucleotide sequence
35   corresponding to SEQ ID NO:161 and capable of
      expressing the encoded polypeptide under

conditions permitting expression of the
recombinant DNA; and

(b) harvesting the polypeptide from the culture.

5

    64.   A host cell containing a recombinant
DNA vector comprising vector DNA and a DNA sequence
selected from the group consisting of:

10   a DNA having a nucleotide sequence corresponding
        to SEQ ID NO:160; and

        a DNA having a nucleotide sequence corresponding
        to SEQ ID NO:161;

15
and capable of expressing the encoded polypeptide.

    65.   A polypeptide according to Claim 27
        which is:
20 Met Ala Asn Cys Ser Ile Met Ile Asp Glu Ile Ile His
    His Leu
    Lys Arg Pro Pro Asn Pro Leu Leu Asp Pro Asn Asn Leu
    Asn Ser
    Glu Asp Met Asp Ile Leu Met Glu Arg Asn Leu Arg Thr
25 Pro Asn
    Leu Leu Ala Phe Val Arg Ala Val Lys His Leu Glu Asn
    Ala Ser
    Gly Ile Glu Ala Ile Leu Arg Asn Leu Gln Pro Cys Leu
    Pro Ser
30 Ala Thr Ala Ala Pro Ser Arg His Pro Ile Ile Ile Lys
    Ala Gly
    Asp Trp Gln Glu Phe Arg Glu Lys Leu Thr Phe Tyr Leu
    Val Thr
    Leu Glu Gln Ala Gln Glu Gln Gln [SEQ ID NO:89].
35

    INTERLEUKIN-3 (IL-3) MULTIPLE MUTATION POLYPEPTIDES